FOOD MANUFACTURE

Vol. XIX, No. 10 October 1, 1944

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Published on the first day of the Month
by
LEONARD HILL LIMITED
17, Stratford Place, London, W.1
Telephone: Mayfair 7383

SUBSCRIPTION

Single Copies	1s.
Annual Subscription	10s.
Abroad	12s. 6d.

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

The Romance of Margarine

MARGARINE provides one of the most romantic stories of the Oils and Fats Division of the Ministry of Food. That is the opinion of Sir Herbert Davis, Director of the Division. The weekly ration is linked with remote places in the Antarctic, the creeks of West Africa, and the shark fisheries of the tropics. Two and a half years have elapsed since Japan captured Malaya, the Dutch East Indies and the Philippines and deprived the United Nations of 1,250,000 tons of oils and fats annually—as great a quantity as this country formerly used in a whole year. Yet there has been no reduction in the fats ration of this country since it was fixed at the present level on January 12, 1942. "That is quite an achievement," said Sir Herbert, speaking at a special conference in London. Until Japan overran the Far East we had many sources of fats supplies; our main trouble was freight. As soon as the Philippine supplies were lost the United States began to look to our sources of supply, and early in 1942 Sir Herbert Davis arranged with America a plan for buying in the various parts of the world. The United States looks after the purchase of supplies in the American continent (except animal fats in the Argentine), and the Ministry of Food purchases supplies from the Empire, the Congo and West Africa.

Hydrogenation has revolutionised the manufacture of margarine. By this process almost any desired texture can be obtained in a fat. Linseed oil is now solidified by hydrogenation and used in soap manufacture. On the other hand, thanks to this process, certain kinds of palm oil are now being used for edible purposes for the first time. The margarine ration absorbs no less than 400,000 tons of fats a year. Shark fishing is a new enterprise in connection with margarine manufacture. The sharks are caught off South Africa, Australia and Mexico, and shark liver oil, which is used to fortify margarine, is seventy times as potent in vitamin A as is cod liver oil. Little whale oil is now obtainable, but Britain began the war with enormous stocks.

Sir Herbert mentioned that the Ministry controls the crushing of 1,400,000 tons of oil seeds yearly, and the residue is used in the manufacture of cattle food.

Buffer Properties of Orange Juice

A study of the changes of soluble constituents of orange juice made by E. T. Bartholomew and W. B. Sinclair (*Plant Physiology*, Vol. 18, 1943, pp. 185-206) at various stages of ripening of the fruit showed that the buffer capacity is due chiefly to organic acids and inorganic salts. The shapes of buffer curves of boiled and normal juice were similar. Although the limits of dilution were not reached in these experiments, juice diluted one part in four of water and undiluted juice had the same buffer capacity.

Rating of Industry

A change in the basis of charging local rates on industrial premises is recommended in a recent report on Rating Reconstruction.

This report, issued by the Association of Rating and Valuation Officers, states that services provided by local councils fall into two classes: those which benefit property and those which benefit individuals. For instance, fire prevention, drainage, and water supply are of benefit to property; and education, child welfare, and social services are of benefit to persons.

The Association suggests this classification forms a good basis for rating industry and recommends that industrial premises pay only that part of local rates levied for property-benefiting services and be exempt from that part levied for services benefiting persons. It is not possible accurately to estimate what would be the effect of this basis of charge, but in the Association's opinion it would be unlikely to cause any great rise above the present level of rates paid by industry.

The merit of the suggested basis, the report claims, is that it is more intelligible to the layman and more logical than the present basis of de-rating which was last revised in 1929.

Potato Factories' Rôle

The chain of potato factories operated by the Ministry of Food is playing an important rôle in facilitating the proper utilisation of the enormous crop now produced in Great Britain. This fact was revealed by Captain John Mollett, Director of Potatoes to the Ministry of Food, at a special conference held at the Ministry of Agriculture. England and Wales have 950,000 acres under potatoes this year. This is about the same figure as in 1943, but it is double the pre-war acreage. Although many farmers are now growing potatoes for the first time and much of the land used is not ideally suited to the crop, the average tonnage per acre of main crops has been maintained at the pre-war level of 7 tons.

Potatoes are the nation's insurance crop against famine, but in spite of the enormous tonnage produced last year there has been no surplus and, thanks to the factories, there has been no wastage. Marketing the vast tonnage is carried out on behalf of the Ministry by the experienced staff of the Potato Marketing Board. The ability of potatoes to store well has been found to depend on where they are grown, rather than on the variety. Thus King Edwards and Majestics grown in Lincolnshire and the Isle of Ely keep much better than supplies of the same varieties grown in the western counties. The marketing plan is therefore to use up the poorer-keeping stocks first, to build up an end-of-the-season reserve of long-keeping stocks, and to use the factories for preserving the balance and avoiding waste.

Potato stocks are examined periodically and tubers that show signs of deterioration are sent to the factories. Consequently the bulk of the potatoes processed in the factories are converted into meal for feeding to livestock. A certain amount of "mashed potato powder" is, however, made for consumption by the Forces, and manufacture of this product is expected to increase. A quantity of potatoes is also canned for the Services. Prospects are that the potato factories will be as valuable in peace as in war. Britain will be mainly dependent on home-produced animal feeding-stuffs for many years to come. Thus a market for potato meal seems to be assured, while mashed potato powder and other products for human consumption are expected to find an outlet, particularly in the catering trades.

Compulsory Heat-Treatment of Milk

Several months will probably elapse before any area in Great Britain is scheduled for purposes of compulsory heat-treatment of milk. In the majority of towns that have been asked to prepare heat-treatment schemes a certain amount of plant and equipment must be provided; and in every town labour will be required to operate the plant, collect the raw milk and deliver the processed product to the dairies. In some areas no additional plant but extra labour will be needed. The Minister of Food, we are informed, will not feel justified in scheduling any area until he is satisfied that the plant, equipment and labour are available and that the labour will continue to be available at all times. As the milk industry, in common with all others, is sadly understaffed, it is not possible to foresee how or when extra staff can be provided to operate heat-treatment schemes.

Another problem is the cost of heat-treatment. The Ministry's costings show that the average cost of heat-treatment is about ½d. per gallon; but as the cost of processing is included in the retail distributive margin, the Ministry argues that, if a separate allowance be made for heat-treatment, the ordinary margin must be reduced by an equal amount. That would reduce the remuneration of a large number of small retailers—a step the

Ministry does not wish to take. The Ministry proposes, therefore, to keep the distributive margin at its present level and to pay a heat-treatment allowance of ¼d. a gallon.

This compromise has met with strong opposition from a large section of the distributive trade. The Ministry's estimate of ¼d. a gallon as the cost of heat-treatment is declared to apply only to large firms. Medium and small firms, it is claimed, cannot process at less than 1d. a gallon, and in some cases the cost is said to be as high as 1¾d. The critics aver that the Ministry's offer of ¼d. a gallon would compel still further large numbers of small firms to sell out to the bigger ones. Colonel Llewellin is anxious that the "small men" should continue to operate under heat-treatment schemes and admits that their processing costs per gallon are higher than those of the larger distributors. He has therefore to consider the pros and cons of (*a*) keeping the cost of heat-treatment as low as possible in the national interest, and (*b*) fixing a scale of heat-treatment allowances that will enable even the smallest firms to continue to pay their way. A point to be considered from the national viewpoint is that system (*b*) may give employment to the larger number of workers.

Home Bacon-Curing Revival

Home curing of bacon is experiencing a brisk revival, due to the success of the pig club movement sponsored by the Small Pig Keepers' Council. Many pig owners who retain a carcase for their own use within the provisions of the scheme wish to cure one or two sides of bacon. It is essential, however, that such bacon be longer-keeping than the modern mild-cured factory product. The art of home-curing was found to be nearly extinct and the Council spared no pains to revive it. As a result the Council has now 64 certified instructresses available to give advice and training in all parts of the country in the home-curing of bacon and hams.

In spite of this revival, the pig club movement is giving valuable assistance to the bacon-curing industry. There are 5,069 of these clubs, 1,991 being pig owners' clubs and 3,078 clubs of co-operative type. About 200 of the latter are operated in connection with industrial canteens. Co-operative clubs are under an obligation to sell at least 50 per cent. of their pigs to the Ministry of Food, whence they find their way to the curers. In practice the proportion sold to the Ministry exceeds that figure, and in the latter half of the 1942-43 pig year reached 75 per cent. Pig owners' clubs sold 69 per cent. of their output to the Ministry in the same period. It would seem that the pig club movement produced approximately 2,500 tons of pork for sale to the Ministry last year, and the Ministry is still sending at least 80 per cent. of its pigs to the bacon factories.

The Small Pig Keepers' Council is now framing plans with a view to ensuring the continuance of pig clubs after the war. There is believed to be a post-war need for them, particularly among cottagers on the countryside and industrial canteens in urban areas. The art of home bacon curing may therefore have a long future as well as a long past. In framing regulations for the post-war period the non-commercial character of the clubs will be maintained. Thus the number of pigs a club may keep will continue to be limited.

The Whale Industry

With world stocks of oils and fats so much depleted, interest is roused by an international whaling conference recently held in London at which it was proposed to include an extra month in the first post-war whaling season in the Antarctic. The 1938-39 season yielded 38,000 whales, with a total of 500,000 tons of oil; yet this figure was regarded as rather high, so that only 16,000 blue whales is to be the post-war aim—a target not likely to be attained with factory ships serving as tankers and whale catchers as U-boat chasers.

The food industries became interested in whale oil just prior to 1913, when the Norwegians (who are as skilled in dealing with marine oil as they are with the harpoon) began to hydrogenate whale oil on a large scale and to include it in margarine. From that date European countries made greater use of such hardened oils than was the case in the United States, particularly for compound lard and margarine. Inclusion of such treated oil in the latter commodity has been claimed to impart a much desired translucent appearance, a smooth texture, and to permit the inclusion of appreciable water content without the trouble of "weeping." As for the objection to traces of nickel—hydrogenated whale oil contains from 0·5 to 2 mgm. nickel per kilogram—experiments have shown not only that many times this proportion of nickel in the diet has no deleterious effect, but also, according to the investigations of Erlandsen, Fridica and Elgström, that 250 people fed on margarine containing up to 28 per cent. hydrogenated whale oil suffered no adverse effects, whale fat being as easily digested as butter fat.

Low stocks of edible oils add especial interest to the rise and decline of British whaling ports and the contrasting dominance of Norway. Early centuries had shown the possibility of boiling down blubber (or "trying out," as it is called) on board ship, ships of 100 tons first appearing near Newfoundland and later at Greenland. The British began to participate when Spitzbergen became the venue, the Dutch following and becoming rivals during the early seventeenth century. Boiling vats on shore with built-in stokeholds seemed to be preferred, although a tonnage of 200 had been reached in the whalers. The Dutch went ahead by following

the whales along the ice when they left their shore habitat; Smeerenburg (appropriately named!) became "Blubber Town," with stores, churches and signs of prosperity. By the eighteenth century the British had staged a come-back, Hull, Liverpool, Whitby, Leith, Dunbar and Dundee becoming noted—especially the first three whaling ports. Before large tanks superseded barrels for blubber and over-whaling brought the scare of scarcity, whalebone fetching £500 a ton gave a fillip to the industry. But substitutes for whalebone, coal gas for whale oil illuminants, and other factors brought decline—at least where the British whale ports were concerned—and Hull, the last of our ports for the Greenland grounds, closed down in 1868. Modern whaling by the Norwegians was a different story, more than 700,000 barrels of oil representing a year's harvest.

Feeding Amino-Acids

Experiments with dogs reported by S. C. Madden, R. R. Woods, F. W. Shull, and G. H. Whipple in the June issue of the *Journal of Experimental Medicine* (Vol. 79, pp. 607-624) showed good results from the feeding of pure amino-acids. The authors say that the ten growth-essential amino-acids of W. C. Rose, plus glycine, will maintain nitrogen balance and produce as much new plasma protein as will good diet proteins. This good utilisation has been demonstrated over several months, whether the amino-acids were given orally or parenterally. The dogs thus fed were outwardly normal, but it is interesting to note that they had a lowered resistance to infection and to certain intoxications. There was no evidence of toxicity in general or of toxicity from unnatural forms (isomers) of the synthetic amino-acids. Given parenterally, appropriate mixtures of the amino-acids were well tolerated even upon rapid injection. Two casein digests were less satisfactory nutritionally and were less well tolerated than mixtures of pure amino-acids. Skin lesions observed after 10 to 20 weeks on a synthetic diet are thought to reflect a deficiency of a member or members of the vitamin B_2 group.

A Harvest of Names

The harvest-time of apples and other fruits brings to mind the many names of men which have been perpetuated by association with such fruits of the earth. Bramley's Seedlings celebrating the work of a Nottinghamshire shoemaker; Cox's Orange Pippin (so different since it should have 51 chromosomes or "atoms of heredity" when actually it has only 34); the apples of Thomas Knight, who came down from Oxford and became a Hereford squire—such are but a few examples of names which, unlike "quisling", are recalled with pleasure. One would like to see written a history of such men who found fascination in cultivating fruits and improving on wild Nature. In it one would read of Laxton, who founded a firm conjuring thousands of cross-bred apples, pears and plums after Laxton himself had experimented with peas for Charles Darwin; of Sir William Gage of greengage fame; Judge Logan and his loganberries; John Stair, schoolmaster of Aldermaston, and his "Stair's Pears", not so well known nowadays as "Williams", named after nurserymen took them up, or as "Bartletts", as they became when Enoch Bartlett spread them through America. The large-scale work in Russia on "two-storey" trees defying the weather and normal behaviour by yielding tangerines and lemons in Siberian orchards, and grapes and apricots grown in Moscow, should emphasise the point that we tend to forget such pioneers in this country as Myatt of Deptford, father of rhubarb, recognised after confusion with "Turkey rhubarb" had at last been banished!

Bottle Habits

Before the recent statement by the National Dairymen's Association on the misuse of milk bottles the term "bottle habit" referred either to an excessive addiction to the second member of the monohydric alcohol series or to the faith of those whose home was incomplete without a great assortment of patent medicines. Mr. Robert Lynd, in referring to the latter, who have turned from the church to the chemist's shop in search of faith, suggested the slogan: "While there's dope there's hope!" Though Helen of Troy had no aspirin to soothe her troubles in that place, the public of today can turn either to a vast array of "secret remedies" in bottles of every size and tint—bottles which are hoarded so jealously to the last drop—or they, as panel patients, place equal faith in a bottle of doctor's medicine rather than merely listen to his advice.

The milk trade is faced with a similar habit of collecting bottles, but hardly for the use intended. As with the railway companies, which, when recently criticised for charging threepence a cup for tea, gave the perfect answer that they had to replace some three and a quarter million cups per year, so with the N.D.A., who have to contend with the public's bottle habit so extensive that millions more bottles per year are required than should be the case. Ten thousand milk bottles, for example, became vases on graves in Manchester cemeteries; thousands were left concealed in hedges after picnics; others were inverted and cemented in ornamental garden paths, or became containers for petrol or paraffin, or even for the small boys' tiddlers. In the economic study of packing food in glass the milk trade has a special problem of its own, with returnable packings not returned, and the average expectancy of life of a milk bottle reaching but forty excursions.

Wartime Fish Research

SPECIALLY CONTRIBUTED

A Floating Laboratory, s.s. *City of Edinburgh*.

WHEN the Department of Scientific and Industrial Research decided on the establishment of a station specifically to be devoted to fish food research, the natural advantages of Aberdeen—its prominence as a "white" fishing port, its proximity to the north-east herring ports, and the modern outlook of the fishing industry in the city—made it an obvious choice, the more so since the Marine Laboratory of the Fishery Board for Scotland was already established there. Moreover, Aberdeen, besides possessing a University with a progressive science school, is a centre of agricultural and biological research.

The Torry Station

The Torry Research Station was founded in 1929 at Torry, Aberdeen, and has been since then a vital link in the chain of food research stations located at strategic centres throughout Britain.

A derelict shipyard at Torry, a fishing suburb at the mouth of the Dee, offered a site convenient to the fish-market, the open sea, and to all the essential contacts for the work. And while the premises cannot compete in architectural beauty with more recently constructed research stations, they possess the fundamental virtues of practicability and efficiency. One building—the former shipyard office—houses the director's office, library and business office, general and specialised laboratories; another, the mechanised experimental equipment, workshops, cold stores, engine-room and further laboratories.

This equipment gives an indication of the dual function of the Station. It not only conducts pure research, but is increasingly concerned with its application to the daily routine of the industry, to the special problems which develop from time to time, and to the anticipated problems and requirements some years ahead. The practical side has been particularly evident in the war years, and it may be that this angle of the Station's function has been more appreciated by the layman than the laboratory work which preceded its application. The two aspects are so closely interlinked that such differentiation is perhaps impossible, but this greater necessity for applicable results in wartime has led to most valuable work on dehydration, smoking and similar processes as well as to the undertaking of many important duties associated with Ministry of Food investigations. To facilitate these practical experiments, the Station has its own constructional workshops in which equipment is built. The operation of its own vessel, the *City of Edinburgh*, a drifter using a three-quarter trawl, ensures that the raw materials for use in experimental work will be provided under known conditions, at a particular time and from a particular location, an invaluable essential in work which deals with so perishable a commodity as fish.

The Station is staffed by a director, four qualified scientific officers, specialising in chemical, bacteriological and physical work, four technical assistants, five laboratory assistants, engineer, joiner and workshops staff. The skipper and crew of the *City of Edinburgh* complete the personnel—which cannot be regarded as excessive in view of the fact that it is the only national centre concerned in fish food investigations.

Scope of Research Work

The Station's task, and its problems, start from the moment the fish leaves the water (previous to which it is the concern of another department), so that it must of necessity deal with the catching, handling, stowing, preservation, processing and packing of fish, the spoil-

Trawl coming aboard the *City of Edinburgh*.
Photo: Crown Copyright.

Nets coming over.

Photo: Crown Copyright.

age at any of these stages, and the extraction of by-products.

Hence the particular value of the *City of Edinburgh*, which, with its floating laboratory, permits " on the spot " work, as and when this is found to be essential. The accuracy of results, ensured by its use, permits an excellent starting-point from which all subsequent research can be based. Fish is on occasion drawn from outside sources, when particular investigations demand this.

In 1933, the superintendent of the Station gave an outline of the results of work done on the handling and stowage of fish on board two specially chartered trawlers. It was found that the fish was stale after six days of stowage in a normally rough-and-ready ship and after twelve days in a ship taking all possible hygienic care and precautions. Ice, at the best, can keep fish in good condition for only twelve days, and as trawlers are frequently away for periods which necessitate stowage for longer than that, it is inevitable that a certain portion of the catch will come home stale —some of it being so stale as to be unfit for human consumption. In view of this unsatisfactory position experimental work was continued on board the two trawlers, which had been fitted with brine freezing plant and a cold store.

Freezing and Storage

High temperatures of freezing and storage were tried out—with poor results. Lowered temperatures showed rather better results. The establishment of the Torry Station gave a permanent home for such work on a more elaborate scale than had previously been possible.

After exhaustive tests had been carried out, it was decided that rapid freezing must be followed by low

Nets opened.

Photo: Crown Copyright.

temperature storage, since even rapidly-frozen fish—*e.g.*, fish frozen in sodium chloride brine at −4° F., very soon undergo undesirable changes in texture and palatability when stored at temperatures such as 15° F., commonly used then and even now for the storage of fish.

Satisfactory results were, however, obtained by storing the brine-frozen fish at −4° F. After six months at this temperature the fish, on thawing, was practically as good as when it was frozen—*i.e.*, only a few hours out of the sea.

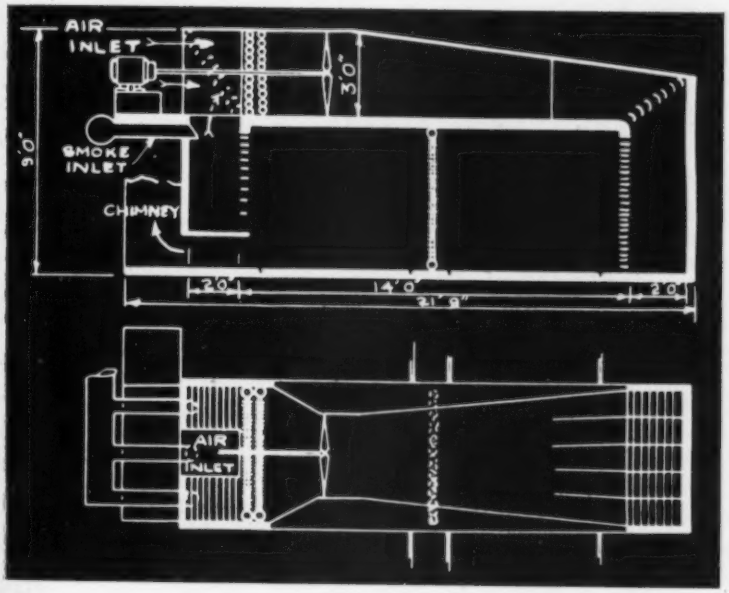
At the Station recently haddock caught in August, 1943, and lemon sole caught in September, 1943, thawed out that morning and cut into fillets the same morning, was tasted by the author. The fish was firm, was devoid of " off " odour, and when cooked it tasted delicious—the successful result of persistent experimentation.

Equipment for Brine Freezing

The apparatus used for brine freezing is located in the main building, and has been constructed by the Station staff to its own requirements. A pulley arrangement allows a cage, filled with fish fresh from the *City of Edinburgh*, to be lowered into a sodium chloride brine freezing tank at −4° F. The frozen fish after being " glazed " is then transferred to storage chambers at −4° F. or lower. A rapid reduction of temperature in freezing is essential, so that the period during which the high temperature zone of maximum alteration (32° F. to 23° F.) is experienced can be limited to less than, say, 100 minutes. Brine freezing, air blast freezing, and metal contact freezing can all be satisfactorily used to this end. There are seven cold stores at Torry ranging from 32° F. to −22° F. and fitted with controls so that the temperature, when once regulated, varies little. The refrigerating plant consists of a single stage ammonia compressor for cooling the brine in the freezer, and two double stage compressors to cool the calcium chloride brine circulated through the storage chambers.

First experimental fish smoking kiln.

Photo: Crown Copyright.



Section and plan of smoking or dehydrating kiln.

Photo: Crown Copyright.

Kippers in larger smoking or dehydrating kiln.

Photo: Crown Copyright.

The experiments demonstrated that cod, haddock and other "white" fish, if frozen whilst still in the freshness of "rigor mortis," will practically remain in that condition for about eight months when stored at −22° F., being still highly acceptable even after four years. The fish after nearly ten months' storage is indeed superior to the bulk of fish normally offered for sale, as evidenced by the tasting trial aforementioned. For ungutted herring the corresponding storage life at −22° F. is about six months, the shorter period being influenced by the fatty nature of the fish. The experiments have proved that in this question of fish storage the overriding factor, apart from the initial freshness of the fish, is the low temperature of storage rather than the speed of freezing. It is better, for instance, even to freeze fish slowly (freezing time ten hours) and store at −22° F., than to freeze rapidly (freezing time twenty minutes) and store at 14° F.

Mother Ships

A question for the fishing industry is whether these positive results can be put into operation by the provision of adequate freezing followed by adequate storage facilities. Two firms have developed adequate systems of servicing a catching fleet from a properly equipped mother ship, but economic difficulties have stopped this very praiseworthy experiment. A French concern has also been reported to have successfully exploited large trawlers fitted for freezing and storage in the Newfoundland and Mauretanian grounds. Leaving the question of white fish aside, it is clear that the same difficulties do not confront the herring industry. Supplies are adequate and within short enough distance of the British coasts to permit the successful application of freezing on British shores. The Torry Research Station has demonstrated that kippers and canned packs can be successfully produced from herring stored for many months, and there can be little doubt that the adoption of this method would materially help to even out the seasoned gluts and slumps of herring—thus providing more regular and extended work for canners and kipperers alike.

Smoking and Curing

Smoke curing of fish has been practised from the earliest times, but not until recently have any scientific data been available. Today, as for some years past, the Torry Research Station is still actively interested in smoke curing. The fact that specially designed smoke curing plant is now undergoing test under commercial conditions is a good testimonial to the success of the laboratory investigations. Early work by the Station showed a considerable variation in the results obtained in the traditional kilns by the same smoker using the same materials, loss of weight varying between 10 per cent. and 20 per cent., while flavour, appearance and keeping quality also varied. Kippering as a mode of preservation depends on the combination of drying and smoking, the two being about equal in importance. A typical procedure is to brine herring in an 80 per cent. to saturated solution of common salt for 10 to 20 minutes, resulting in a 2 per cent. to 3 per cent. sodium chloride content in the finished article. The herrings are then hooked on sticks ("tenters") which are fitted in tiers into a tall brick kiln. Smoke from the fire of oak chips and sawdust burning on the floor is carried up amongst the fish by natural draught, and the period and intensity of smoking is entirely at the discretion of the smoker, who is an expert, but whose product is very variable—as might be expected in view of the conditions under which he operates. These variations have made it evident that a scientifically controlled kippering process might be substituted with advantage.

Controlled Kilns

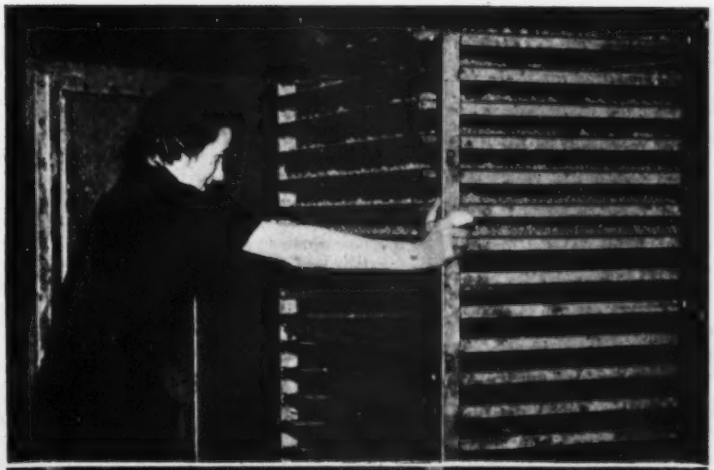
Work on experimental controlled kilns was therefore carried on as part of the programme of the Food Investigation Board. The first kiln designed still stands in the Torry Research Station alongside the much larger commercial unit developed from it. An analysis of some of the conditions essential to successful kippering was first made with the following conclusions: temperature should not exceed 27° to 30° C. except during the first half-hour; there should be a uniform air flow through the kiln sufficient to reduce gradients to the point where the loss of water from the fish in all parts of the kiln is within specific limits; and the smoke density should be uniform.

First, a small kiln with a holding capacity of 1,500 herrings or small fish of similar size was built on experimental lines to prove calculations made after a consideration of all these factors. The smoke box is operated externally as an independent unit, and is a double banked brick and concrete unit with four open hearths on each side of a central vent. Sawdust and chips, preferably of oak, are piled in some or all of these eight chambers in such a way that the continuous collapse of the sawdust at the burning edge automatically feeds the fire. This apparatus permits control of the volume of smoke entering the kiln and—a quite important point—keeps the cure free from sooty smuts.

Heating the Smoke

The smoke mixed with any desired amount of air is heated by thermostatically controlled steam or electric heaters and fed by a fan into the horizontal smoking chamber of the kiln in which the closely packed load of tentered fish is hung in tiers upon wheeled trucks, so that the fish hang edge on to the air stream. Uniform flow of the air in the chamber is obtained by a special arrangement of aerofoils and diffuser inlet and outlet walls comprising a series of horizontal slots of adjustable depth. Any desired proportion of the air and smoke mixture, which is recirculated through the chamber by way of an overhead external duct which houses the fan, can be rejected up a chimney to the outer atmosphere. In this experimental kiln it was shown clearly that control of the essential factors involved in smoke curing was readily obtainable and that fish in batches were cured uniformly to any desired degree with substantial saving in time and labour as compared with traditional procedure. A unit of commercial size—holding about 5,000 herrings—has been successfully designed and operated; and by combining a series of batch units side by side to form a cross-flow tunnel continuous operation is made possible, the trucks being pulled at fixed intervals of time from one unit to the next.

The experimental work on kilns stood in excellent stead when dehydration of fish was attempted, since the plant, minus the smoke box, was readily modified to



Placing the fish in cooling and drying cabinet after mincing.

F.M. Photo.

Through the oven into a different department. Herrings are now cooled in a refrigerator.

F.M. Photo.

Power mincing after dehydration.

Photo: Crown Copyright.

Mincers delivering minced fish on trays.
Photo: Crown Copyright.

form a warm-air drier, horizontal wire-meshed trays replacing the fish tenters. Roller drying has also been investigated.

In February, 1944, the Torry Station published the results of work on the dehydration of fish, and investigations are still proceeding. The first attempts to dehydrate fish showed that whole fillets " case hardened " while drying, and that for either air or roller drying it was essential that the fish be minced or otherwise disintegrated. The fact that the whole fillets did not reconstitute well was another reason for mincing. In the early experiments, too, the entire fish (after gutting) was included, but the presence of head, skin and bones necessitated grinding to a fine powder, resulting in a pastiness not generally approved. Yet, although the inclusion of these constituents created a rather " fishmealy " flavour and odour, such dehydrated whole fish, when made up into fish cakes, was eaten in works canteens with a considerable degree of acceptance. It was apparent, however, that, for a high quality product, only the flesh of the fish was suitable, and this policy was adopted.

The drying of uncooked fish had also resulted in the flesh sticking to the meshed drying trays. The solution to these problems was the precooking of the fish flesh and its subsequent mincing in a power-driven butcher's mincer. Heated, boned fish are now cooked in a canners' steam-jacketed cooker for half-an-hour at 2-lb. steam-pressure, the resultant cook (less the juice which is discarded) being then minced before being spread evenly on wire-meshed trays. Splitting, gutting and boning machines are used in the case of herrings, skin being included, since it is impracticable to remove it. White fish fillets without skin are prepared by hand in the normal manner.

Close-up of a mincing operation.
F.M. Photo.

Exhaustive drying tests, using the modified smoke kiln already mentioned, have shown that most favourable results are obtained when the temperature of the fish has not exceeded 65° to 70° C. at any stage. The shorter the drying period involved, the more tender was the final product, and because of this a practical limit to drying was set at about four hours at a standard airflow of 10 feet per second with a tray loading of 2 lb. of cooked mince per square foot. Drying can be further accelerated by increasing the air speed and reducing the tray loading, but the economic limits are possibly 15 feet per second and 1½ lb. per square foot respectively. The new drying kiln has a capacity of 1 ton of cooked fish. Lean, fatty, fresh or smoke cured fish can all be treated in this way.

Roller drying has been investigated, but on a relatively smaller scale. In this case, minced raw or cooked fish—cod, haddock and whiting—were dried on a small roller drier at about 4½ r.p.m. on rollers (1 foot in diameter and 2 feet in length), heated to a surface temperature of 142° C. by steam at a pressure of 40 lbs. to the square inch.

The fish came off the rollers as a continuous lacework of thin white porous ribbon, which on reconstitution had a quite satisfactory texture and flavour. A good product could probably be obtained on a commercial scale by this method.

An interesting series of products consisted of smoked cod fishcakes, herring and kipper fishcakes made from

(*Concluded on page* 355)

Fish being cleaned and sorted through a sieve.
F.M. Photo.

Closing tins of finished product.
F.M. Photo.

Spreading cooked and minced fish previous to dehydration.

Photo: Crown Copyright.

Nutrition Epitomised

DR. HENRY C. SHERMAN, Chief of the Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, U.S.A., has written, mainly for the layman, a handy little booklet* which epitomises the principles of nutrition and the nutritive value of food.

The subject is handled in a very clear manner, and the different items are arranged for quick reference.

At the end the author gives a brief but interesting summary of the general trends of food consumption in the United States. "Of calories and protein," he says, "our national food supply furnishes amounts sufficiently above our demonstrable needs to approximate the optimum or possibly more . . . even among the sufferers from extreme poverty, calories and protein are not the most serious danger points, while in the great majority of American families these are so far on the safe side that we could not expect an increased consumption to bring any benefit to nutritional well-being."

Dr. Sherman considers that those who might disagree with this opinion as regards protein may be influenced by the persistence of impressions derived from earlier times. "There is a traditional social and literary custom, unbroken since at least the time of Homer, of treating the meat dish as the main dish of the meal."

He points out that the average American food consumption in 1935-39 barely met the requirements laid down by the National Research Council as regards calcium, and showed a very small margin in 1943. He also states that the recent programme of "enriching" white flour and bread and "restoring" refined breakfast cereals, atones in fair measure for the processing losses in iron, thiamine and niacin, but does not restore the lowered protein value. The use of skim-milk powder as an established practice in bread-making is recommended.

This little publication would prove useful in the hands of those who have to do with works canteen management. For those unversed in the general principles of nutrition who desire to study it, it is an excellent introduction to the subject.

Books for the Services

THE demands of the Services for books are increasing daily, and it is hoped to be able to maintain a constant stream of supplies. Already millions have been sent to all parts of the world, including huge quantities for the fighting fronts.

Millions of books are needed at once, and the Prime Minister has issued the following message:

> "As more of our men and women go overseas to the fighting fronts the demand for books, magazines and periodicals increases rapidly, and we want your help to meet this need. Every family can respond, and you may be sure that any book you send will give pleasure and relaxation, not to one only but to many.
>
> "To send your books to the Services is simplicity itself. Just hand them in, unwrapped, unstamped and unaddressed to any post office. And once having started, keep up the good work. Take your books and magazines to the post office as often as you can and ensure a regular supply.
>
> "You can also help by giving books and magazines to the collectors whenever there is a book drive in your district.
>
> "It is a good cause. Let your response again be prompt and generous."

Books are required for study as well as for reading, and business men can greatly help by drawing the attention of their staffs and employees to Mr. Churchill's appeal. This could easily be done by displaying typewritten copies of the message in prominent positions.

* *Principles of Nutrition Value of Food*, by Henry C. Sherman. U.S. Department of Agriculture. Miscellaneous Publication, No. 546. Pp. 40.

Autumn-Sown Wheats

AFTER consultation with millers, bakers, seedsmen and growers the National Institute of Agricultural Botany, Cambridge, has compiled a list of autumn-sown wheats that have proved themselves in their respective spheres. Holdfast, Redman, Warden and Yeoman are considered to be primarily suited for bread-making; Wilhelmina, Wilma (provisionally included), Juliana, Victor, Little Joss, Steadfast and Squarehead's Master, for biscuit-making; but Jubilegem, Bersee (provisionally included), Squarehead 11, Vilmorin 27 and Rivet, while good yielding wheats, are only used for milling and baking to a limited extent. Full information on this important subject is contained in leaflet form (Farmers' Leaflet No. 8), which is obtainable free of charge on request from the National Institute of Agricultural Botany, Huntingdon Road, Cambridge.

World Sugar Situation

THE U.S. Bureau of Agricultural Economics in a report, entitled *The World Sugar Situation*, which was issued on September 2, said, in part:

Sugar supplies available to the United Nations during the current year are slightly larger than they were during 1943, but are likely to be smaller in 1945 because of prospects for a smaller crop in Cuba and reduced stocks in both producing and consuming areas.

Total supplies for the U.S. apparently will be about 20 per cent. larger during the calendar year 1944 than they were in 1943. This is almost entirely the result of increased production in the Caribbean Islands, principally Cuba. The production of beet sugar, from the crop harvested in the fall of 1943, was drastically reduced in both the U.S. and Canada.

Stocks of sugar available to the United Nations on January 1, 1944, in exporting countries were about one-third smaller than they were one year earlier.

Stocks in the U.S. amounted to 1,761,000 short tons, or 18 per cent. less at the beginning of 1944 than in

1943. Stocks in Cuba declined to 647,000 short tons, or 64 per cent. below those of the previous year. The decline in the U.S. was primarily the result of the short beet crop harvested in the fall of 1943. The much larger decline in Cuba reflected the relatively small 1943 crop and the improvement in shipping conditions.

The distribution of sugar from the Caribbean Islands continues to be under the close supervision of the Governments of the U.S., Canada and the United Kingdom. Supplies of sugar available from the islands are allotted to the principal claimants by the combined food board.

Sugar supplies in the area controlled by the United Nations are likely to continue to be relatively scarce and the demand large, as long as the war in Asia continues. Imports of sugar from the Philippine Islands and Java were cut off by the war. Also, the loss of rubber imports from the Far East has created a vital need for tremendously increased supplies of alcohol for the manufacture of synthetic rubber. Much of this alcohol has been made from sugar.

Sugar supplies for the United Nations are likely to be somewhat smaller in 1945 than they are in 1944, because the crop in Cuba probably will be considerably reduced because of the lack of two-year-old cane.

The production of sugar in the United Nations and neutrals for the marketing season beginning about September 1, 1943, appears to be approximately 20,800,000 short tons, not including the equivalent of 900,000 short tons used for the production of invert molasses. This is about 800,000 short tons, or 8·9 per cent. more than the production from the same areas for the previous season. It is also about 1,300,000 short tons more than the average pre-war (1935-39) quantity produced in these areas, excluding invert molasses.

However, this does not mean the quantity of sugar available for consumption in the United Nations will be larger than in pre-war years. Prior to the war, the U.S., Great Britain and India each imported considerable quantities of sugar from areas now occupied by enemy forces. The most important sources of these imports were the Philippine Islands and Java, although Great Britain imported some sugar from the continent of Europe.

Sugar stocks on January 1, 1944, in the U.S. and the principal areas supplying the U.S. were about one-third smaller than they were one year earlier. Sugar stocks in continental U.S. at the beginning of 1944 amounted to only 1,761,000 short tons, raw value, a decline of 37,000 short tons, or 18 per cent., from one year earlier. Stocks in Cuba, which totalled 1,800,000 short tons on January 1, 1943, declined to 647,000 tons at the beginning of 1944 as shipping conditions improved. However, the decline in stocks of sugar available for use in 1944 by the United Nations, as compared with the previous year, was less than the increase in production, so that total available supplies are moderately larger than they were last year.

The increase in supplies for the current season has been entirely in cane sugar. The 1943-44 crop in Cuba, estimated at 5,650,000 tons, including the amount used for the manufacture of invert molasses, is 2,410,000 tons larger than that produced from the 1942-43 crop. The crop in the rest of the West Indies is about a quarter of a million tons smaller than last year. A slight decrease also occurred in Hawaii and Mexico. The cane crop in continental U.S. in 1943-44, although small relative to the production in other areas, amounted to 498,000 short tons. This is 8 per cent. larger than the crop of the previous year, and is the largest crop since 1939. The 1943 crop in Australia was 19 per cent. smaller than the 1942 crop and 35 per cent. below the unusually large crop of 1940.

Wartime Fish Research

(*Continued from page* 353)

the dehydrated fish with an almost equal amount of dehydrated potato flour. These compare favourably with fishcakes offered on the market.

A distinctive difference between the fatty and lean types of dehydrated fish has been evidenced. The fatty types pack solidly to any shape and can be compressed to a density as high as 1·0. Lean fish are brittle and a density of only 0·5 after compression has been obtained without pulverisation. So far, it has been found that dried white fish will keep in good condition in sealed cans at ordinary temperatures for about one year, and longer if packed in nitrogen. Dried herring has kept well for eight months, and for more than a year when gas packed.

While work on dehydration has been a very important wartime responsibility of the Station and one on which good progress has been made, other special work has been concerned with the study of anti-oxidants in relation to the prevention of rancidity in fat and of oxidative decomposition of carotene and vitamin A. A very considerable amount of advisory work to the Ministry of Food has also been undertaken relating to miscellaneous problems in the handling and preservation of fish.

It is a reasonable conclusion that the Government announcement of the setting up of a new pilot plant at Aberdeen to investigate the dehydration of herring on the commercial scale will involve the Torry Research Station in an advisory and test capacity, and that to a very great extent the work just described may represent the basic data on which the new pilot plant will function and on which the ultimate commercial herring packing plant will operate.

The proposals for the British herring industry, also announced, will of necessity add to the responsibilities of this centre, and it is again reasonable to assume that the Station is ahead of the industry, and that to a very large extent the new responsibilities will mean advice in the application of already determined data to a given set of circumstances.

That commercial interests are fully appreciative of the work being done for them by the Department is worth noting. Firms with special problems, individuals with problems, involving the use of fish as food, have been increasingly consulting the Department, whose policy it is to render every possible help and to co-operate actively in solving these difficulties. This mutual spirit, evidenced in many ways, is a happy augury for the more scientific approach to the particularly difficult problems of the fishing industry and its establishment on a surer basis than in the past.

Freezing and cold storage, dehydration and packing, based on the data established at Torry, are surely possible methods of curing these long-standing problems.

Gustation

PART III

R. W. MONCRIEFF, B.Sc., A.R.I.C.

Taste Blindness

JUST as differences are found between the odour-perceptive powers of different individuals so in taste such differences occur.

As there are four primary taste sensations it might be expected that some individuals would be deficient in one or more of these, but no such cases have been reported. No person is known, for example, to be sensitive to sour, salt and sweet, but insensitive to bitter substances. True, taste may be completely lost by damage to the nervous system, but no destruction of one taste leaving the others unimpaired has been noted. Work on the critical frequency of taste shows that all four tastes are very intimately connected and that any one taste affects the three others, and it may be that differentiation of the four tastes into different senses has not yet proceeded far enough for complete separation to take place.

Nevertheless taste deficiencies are found and particularly towards synthetics. Whilst dulcin is *p*-ethoxyphenyl urea (*p*-HO $C_6H_4NHCO.NH_2$) and is very sweet, the substance *p*-ethoxyphenyl thiourea (*p*-HO $C_6H_4NH.CS.NH_2$) is bitter and has been used for investigation of taste deficiencies, or taste blindness as it is called. To most people this substance *p*-ethoxyphenyl thiourea is bitter, but some cannot taste it. Snyder[61] investigated this point and found that 68·5 per cent. of the individuals tested could taste it but 31·5 per cent. could not. When neither parent can taste it, none of the children can taste it either. The deficiency is not sex linked or sex influenced, but it is inherited by offspring according to Mendel's Laws. Fox[62] found that the similar bodies, phenyl thiocarbamide ($C_6H_5NHCS.NH_2$), sym-diphenyl thiocarbamide ($C_6H_5NHCS.NHC_6H_5$) and asym-diphenyl thiocarbamide ($(C_6H_5)_2N.CS.NH_2$) were bitter to some people and tasteless to others. The property was independent of age, race, sex and the *p*H value of the saliva but was thought to have some relation to the solubility of the substance in the saliva of the person examined. Levine and Anderson[63] showed that the percentage of individuals who fail to taste *p*-ethoxyphenyl carbamide is much less among the American Indians than among the white population.

Blakeslee[64] examined 103 families for taste deficiency towards phenyl thiocarbamide. He concluded that it was due to differences in the taste threshold and was not a real deficiency. As, however, the threshold value is sometimes so high that a concentrated aqueous solution and even the dry powder cannot be tasted when placed on the tongue, it is for all practical purposes a deficiency. The experiments showed clearly that the inability was inherited, and also that the ability to taste phenyl thiocarbamide did not run parallel with general acuteness of taste.

Physiological

The number of taste buds in man may be greater than has been thought. Mochizuki[65] investigated the foliate papillæ of the tongues of 115 Japanese. There were usually 5 or 6 foliate papillæ at either side, but the total number of taste buds in the foliate papillæ varied greatly in different individuals from 322 to 2,957, and was usually between 1,300 and 1,400. One single papilla may carry between 13 and 441 taste buds, usually between 50 and 100. There were no differences between men and women, but the total number of taste buds was found to decrease with age.

A similar observation respecting age was made by Allara,[66] who found that the gustatory papillæ reach their full development at puberty and remain in this state till the age of 45, when regressive changes occur and atrophy sets in. Recently Richter and Campbell[67] found that the sugar-taste threshold of 58 children averaged 0·68 per cent., whilst that of 52 elderly individuals averaged 1·32 per cent.

The number of papillæ can be counted and the small filiform papillæ are known not to carry taste buds, whilst the foliate fungiform and circumvallate papillæ carry buds in large numbers. The question has been raised whether all the buds in a single papilla are for one of the four primary tastes, say sweet, all those in another papilla for sour and so on. Early workers reached the conclusion that some papillæ had buds sensitive to several tastes, but others only responded to a single taste. Thus Kiesow[68] mapped 39 identifiable fungiform papillæ on one tongue and applied to them with a fine brush solutions of hydrochloric acid, sodium chloride, quinine sulphate and sugar. He found four of the 39 were insensitive to all tastes but the others responded as follows:

	Acid.	*Salt.*	*Quinine Sulphate.*	*Sugar.*
Sensitive ...	18	18	13	26
Insensitive ...	17	17	22	9

Of those which were sensitive three papillæ were exclusively sensitive to acid, three to salt and seven to sugar. None was exclusively sensitive to bitter, possibly as the front of the tongue was used for experiment. Whilst these results largely confirmed earlier work, recent work on induction has illustrated the difficulties of mapping sensitive spots, whilst work on the critical frequency of gustation has shown how each taste is affected by the others. It is true that Lazarev in his theory put forward in 1922 accepted the idea of papillæ being exclusively sensitive to one taste, but even he allowed for some papillæ being sensitive to other tastes as well, and there appears to be nothing damaging to his theory in the idea of each papilla being sensitive to more than one taste. The experimental difficulties encountered by Kiesow and other early workers in painting individual papillæ must have been considerable. The weight of evidence favours the view that papillæ are not generally exclusively sensitive to one taste. According to their position on the tongue they will be more sensitive to one taste, bitter, if at the back of the tongue, for example, but still sensitive to all tastes.

The relation between taste and the circulation of blood in the tongue was investigated by von Skramlik.[69] He found that the application of a 20 per cent. solution of glucose to a frog's tongue stopped temporarily the flow of the blood in the capillaries, and the stronger the solution the more effective it was. Quinine in 25 per cent. solution produced just the opposite effect—an increased flow of blood and twitching of the tongue muscles. The effect of quinine was opposite to that of sugar and immediately overcame it. Dilute 4 per cent. solutions of salt gave a brief acceleration of flow, but more concentrated 10 per cent. solutions stopped the flow. This effect also was immediately overcome by quinine. Weak (0·5 per cent.) tartaric acid solutions increased the blood flow. These observations are very suggestive and appear to have a close correlation with fatigue, which would perhaps repay investigation.

Grisogani[70] investigated the effect of gustatory stimuli on salivary flow. Ordinarily the salivary flow shows periodic oscillation, first flowing, then stopping, then flowing again and so on. Grisogani found that the flow was more abundant and the crests of the waves of flow higher under gustatory stimulus.

It has been reported by Simons[71] that an early symptom of arsenic medication is a change in the sense of taste.

Cocaine will abolish taste and the buccal sensations are abolished in the following order: pain, bitter, sweet, saline, sour and touch, which is an indication of the extent of differentiation the four tastes have undergone. Eucaine-B especially reduces the bitter taste, whilst Stovaine and Gymnemic acid abolish sweet and greatly reduce bitter without greatly affecting salt and sour. Gymnemic acid is obtained from the leaves of the asclepiad *Gymnema sylvestre*.

Work has been carried out on dogs to determine the effect on taste of changes in the mineral balance. Timofeev and Kroll-Lifshits[72] took the saliváry secretion of the parotid gland as an indication of taste. They found that sodium and ammonium chlorides fed to the dogs depressed their taste sensitivity, but disodium hydrogen phosphate enhanced the sensitivity to acids, but depressed it for salts. If the dogs were exercised for long periods their taste became duller, but not if they were first fed with disodium hydrogen phosphate, in which latter case work had little effect on their thresholds.

In the case of man, sensitivity of taste is found under conditions of repose and freedom from distractions. To enjoy the flavours of food or drink the body must be normal and healthy. Constant use of tobacco particularly dulls the sense of taste.

Effects of Temperature

The effect of temperature on taste is of interest, for if taste were purely chemical we should expect it to be enhanced by high and depressed by low temperatures. Olfaction is known to be largely influenced by temperature and the odour of a substance becomes much more noticeable on warming. Meats and vegetables have more flavour when hot than cold. Several times the normal quantity of flavouring essences must be added to iced food. Iced coffee and Ovaltine have but a fraction of the flavour they have when warm. Food and drink can normally be taken with comfort as hot as 50° C.

Komuro[73] measured the limit of taste with acid, salt, sugar and quinine, and found that the sensitiveness just about doubled on raising the temperature from 10° to 20° C. and that it was fairly steady from 20° to 30° C. and then fell off from 30° to 40° C. Accordingly any hypothesis that taste is purely chemical fails, but chemical action may still play a large part in it.

Goudriaan[74] reported that an increase in temperature increased the sensations of sweet and sour, but decreased those of salt and bitter. In the case of mixtures sweet prevails over sour, but salt and bitter prevail over sweet.

Critical Frequency

We know that a visual image persists for an appreciable time, say one-twentieth of a second, after the stimulus is removed or the gaze averted. A similar phenomenon occurs in the case of taste but the response is much smarter, and the duration of the taste sensation is much shorter. Let us say for the sake of argument that it is one-hundredth part of a second, then if we apply an instantaneous taste stimulus to the tongue 50 times a second we shall experience an intermittent taste—non-taste series of sensation—and so if we increase the frequency of the applied instantaneous stimuli to 60, 70, 80 and 90 per second. Now, if we increase the frequency to 100 per second, each new stimulus will come in just as the sensation from the previous stimulus fades and we shall experience a continuous sensation. This frequency will be known as the critical frequency of gustation, and if it is 100 per second, then the persistency of the taste sensation will be 1/100 seconds and similarly, if the critical frequency of gustation is N per second, then the persistency of the taste sensation is 1/N seconds. Clearly, it would be difficult in practice to apply a sweet or bitter substance to the tongue 100 times a second, but it has long been known that an electric current applied to the tongue induces a sour taste, and an electric current is easily controllable as to frequency.

Allen and Weinberg[75] made use of this and set out to find the critical frequency for the sour taste, having little hope of finding suitable stimuli for the other tastes. A current from a storage cell was applied through a potentiometer to control the voltage and a make and break device to control the frequency to two electrodes between which the tongue was placed. The intensity of stimulation was first fixed by adjusting the potentiometer and the limits between which readings were taken were 0·16 volt and 0·70 volt, as at lower potentials no sensation was experienced and at higher, muscular twitching was induced. Having set the stimulus, then the speed of the make and break apparatus was adjusted until the interrupted sensation just fused into a continuous sensation. Care was taken not to fatigue the tongue. When a large number of measurements were obtained for different voltages and were plotted, frequency against voltage, it was found that all the readings fell on four well-defined curves as shown in Fig 1. The curves are similar in character, gently sloping upward at low voltages with a decided increase of slope and rapid convergence towards a point at high potentials. As the potential increases, the critical frequency is reduced, or in other words, the duration of the sensation is increased. The fact that there were four curves is strong evidence of the existence of four fundamental tastes, all of which are stimulated by the electric current. This shows that

they are not independent. There were many more points on one of the curves than on the others and as the predominant taste sensation on passing the current is sour, this curve was taken to be that for the sour taste. Now gymnemic acid is known to anæsthetise the sweet taste and partly the bitter and therefore the tongue was rinsed with ½ per cent. solution of gymnemic acid and critical frequency measurements taken again. This time there were only three curves, sweet being absent, and one of the three, bitter, was very short. In this way the identity of each of the four curves was determined and was as follows (Fig. 1):

A. Sweet. B. Salt. C. Sour. D. Bitter.

Typical durations (inverse of critical frequency) were as follows:

	Duration in Seconds.			
Voltage.	*Sweet.*	*Salt.*	*Sour.*	*Bitter.*
0·20	0·0024	0·0020	0·0018	0·0015
0·40	0·0028	0·0025	0·0023	0·0020
0·60	0·0037	0·0034	0·0030	0·0027

It will be seen that the average duration of the taste sensation is about one-fourhundredth part of a second, and that taste is thus much smarter in reaction than sight or hearing. Bitter is smarter than the other tastes and is known from minimum stimulus measurements to be the most sensitive taste. The sensitivity of the four tastes is in the order bitter, sour, salt, sweet, and this is the same order as that in which the tastes group themselves in increasing order of critical frequency. This, however, leaves out of account synthetic sweeteners like saccharin and dulcin.

Now the taste on electrical stimulation is due to electrolysis of the saliva with formation of ions, and in electrolysis the significant factor is the quantity (coulomb) of electricity obtained by multiplying the current by the time. According to Ohm's Law:

$$i = \frac{V}{r}$$

where i is the current through the tongue
V is the potential difference
r is the resistance of the tongue between the electrodes and may be considered constant.

Where D is the duration and Q the quantity of the stimulus:

$$Q = i\,D$$
$$= \frac{I}{r}.VD = A.VD$$

where A is the constant $\frac{I}{r}$

Taking logarithms:

$$\log Q = \log (VD) + \log A$$

and as V and D are experimentally measured, Q, the measure of the stimulus, can be found.

When the results were examined it was found that the following relation held:

$$\frac{I}{D} = -k \log Q + C$$
$$\text{or} \quad = -k \log (VD) + k \log A.$$

where k and log A are constants.

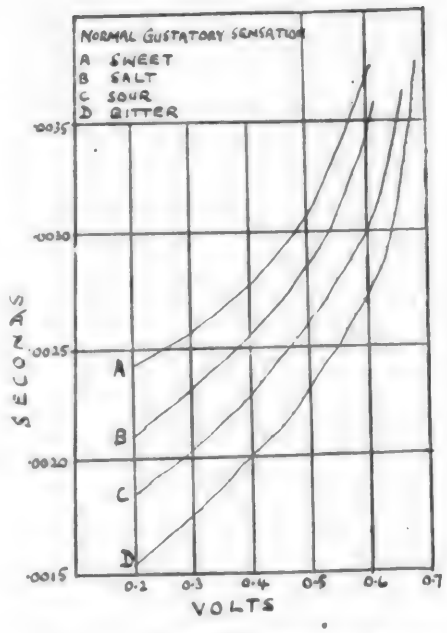


FIG 1. NORMAL GUSTATORY SENSATION
(AFTER ALLEN AND WEINBERG)

The similarity of this to Fechner's Law will be noted. The equation fits the results and when $\frac{I}{D}$ is plotted against log Q the " curves " are straight lines with two abrupt changes of slope as shown in Fig. 2. The convergence of all four curves to a point at a high intensity of stimulation is again well marked. The three branches of each curve are to be noted. Previously it had been thought that Fechner's Law that the sensation is proportional to the log of the stimulus only held for the middle range of intensities, but it is now clear that it holds throughout, but that different constants obtain for very low and very high degrees of stimulation. Similar relations have been obtained for other sensations and may be compared:

Taste $\frac{I}{D} = -k \log Q + C.$

Vision $\frac{I}{D} = k \log I + C$ where I is the intensity of illumination.

Audition $D = k \log P + C$ where P is the air pressure.

Touch $D = -k \log P + C$ where P is the pressure.

We may say that the persistence of the sensation varies either directly or inversely as the logarithm of its intensity. The changes of slope indicate that at some definite intensity of stimulation there is a definite change in the sensitivity of the receptors. Whilst the equations fit the observed results, the physiological significance of the changes from $\frac{I}{D}$ in vision and taste to D in audition and touch and from k in vision and audition to −k in taste and touch is not understood. As the four possible arrangements are taken up with these

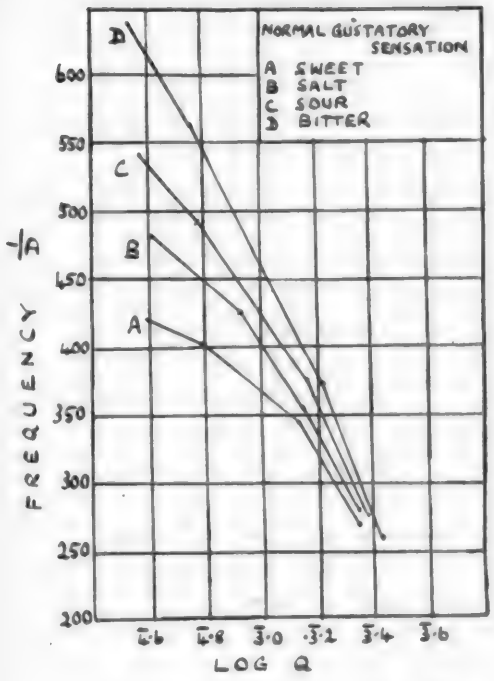


FIG 2. $\frac{1}{D} = -k \log Q + C$.

(AFTER ALLEN AND WEINBERG)

four senses it will be doubly interesting to see what equation prevails for smell, when the critical frequency measurements can be made.

The values of D, the duration, for the different senses are :

Vision	...	0·013 to 0·045 second.
Audition	...	0·0127 to 0·0215 second.
Touch	...	0·0024 to 0·0089 second.
Taste	...	0·0015 to 0·0040 second.

Fatigue

The sense of taste is particularly liable to fatigue. If a toffee is kept still in the mouth the sweet sensation disappears and the result is unsatisfactory, so we keep on moving the toffee round with the tongue, increasing the rate of solution and bringing fresh taste buds into action. Similarly, two successive dishes with the same flavour are not served in a meal. In their experiments Allen and Weinberg took care that the electric current was only passed through the tongue for two or three seconds at a time, and that intervals of 20 minutes or so were allowed between observations to enable the tongue to recover from fatigue. They also made measurements, in cases where the tongue was deliberately fatigued, to observe the results. Generally, the effect of fatigue is to increase the duration of sensation, or in other words reduce the critical frequency and the sensitivity. In the fatigue experiments the same side of the tongue as that on which the electrodes were set was stimulated by solutions of (1) bisulphate of quinine, (2) acetic acid, (3) sodium chloride, and (4) sugar for the bitter, sour, salt and sweet tastes respectively. First a ½ per cent. solution of bisulphate of quinine at the mouth temperature was applied for 45 seconds and the mouth quickly rinsed with water at the same temperature and a measurement of the critical frequency taken. It was found that the duration for all four tastes was increased—*i.e.*, all were fatigued and working at reduced sensitivity. This illustrates clearly the interdependence of the four tastes and explains how such a large variety of taste sensations are known. It was to be expected that application of a quinine salt to the tongue would fatigue the bitter taste receptors and reduce their sensitivity, but it could not have been predicted that it would also fatigue the sour, salt and sweet taste receptors. The quantitative effect may be seen from these figures, all taken at a potential of 0·40 volt :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
Fatigued with quinine bisulphate	0·0029	0·0027	0·0024	0·0022

These differences are well outside experimental error and indeed, Allen and Weinberg in their original paper give their results to another significant figure.

Next, fatigue of the sour receptors was attempted with a 1·5 per cent. solution of acetic acid, applied as before. This proved to depress the salt, sour and bitter receptors which suffered from fatigue, but to enhance the sensitivity of the sweet sensation. Comparative figures for the duration of sensation, all with a potential of 0·40 volt, are :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
Fatigued with acetic acid	0·0026	0·0027	0·0025	0·0021

The duration for salt, sour and bitter is increased—*i.e.*, the receptors have been fatigued by the acetic acid, but the opposite is the case for the sweet receptors. This is the physical interpretation of the well-known experience that sweets taste sweeter after taking something sour. The experience is not " psychological " in the sense that it does not conform to known physical laws. It is not commonly realised though that fatigue with a sour substance makes the subject less sensitive to salts and bitters.

Next, the fatigue of the salt receptors with 10 per cent. sodium chloride solution was attempted. Again, bitter, sour and salt sensations were depressed owing to fatigue, but sweet was enhanced. Over the range 0·52 to 0·65 volt sweet sensitivity was anomalously and very greatly enhanced. The reason for this is not known. Durations of sensation were as follows at a potential of 0·40 volt :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
Fatigued with sodium chloride	0·0028	0·0026	0·0024	0·0021

and at a potential of 0·60 volt, which was in the range of anomalous sweet enhancement :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0037	0·0034	0·0030	0·0027
Fatigued with sodium chloride	0·0024	0·0036	0·0030	0·0028

The salt receptors, as would be expected, are most severely fatigued by the salt solution, but the sour and bitter receptors are also fatigued. The extreme enhancement of the sweet receptors was quite unpredictable. The addition of a pinch of salt to coffee would depress the bitter taste and enhance the sweetness, but it is certainly not usual to add salt to tea where the same considerations might apply.

Finally, a 5 per cent. solution of sugar was used to fatigue the sweet receptors. There was a high degree of depression of the sweet sensation and some depression of salt and sour (bitter not recorded). Using 0·40 volt potential the duration times were :

	Duration in Seconds.		
	Sweet.	*Salt.*	*Sour.*
Normal	0·0028	0·0025	0·0023
Fatigued with 5% sugar ...	0·0031	0·0026	0·0024

Hence fatigue with 5 per cent. sugar solution depressed sweet, salt and sour receptors.

Surprisingly, " fatigue " with a much more concentrated sugar solution, 20 per cent., resulted in enhancement in sensitiveness of all four receptor systems. With a potential of 0·40 volt the duration times were :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
" Fatigued " with 20 per cent. sugar ...	0·0027	0·0024	0·0023	0·0018

Hence the effect of a stimulus upon the gustatory receptors depends upon its concentration, low concentrations causing depression of sensitiveness and high concentrations, enhancement. According to Allen and Weinberg both depression and enhancement reflexes are caused in all these cases and it is just a question of which is the greater of the two. The results of the fatigue are summarised in the following table. It should be remembered that an increase in duration indicates fatigue or depression and *vice versa*.

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
Fatigued with 0·125% quinine bisulphate	0·0029	0·0027	0·0024	0·0022
Fatigued with 1·5% acetic acid	0·0026	0·0027	0·0025	0·0021
Fatigued with 10% sodium chloride ...	0·0028	0·0026	0·0024	0·0021
Fatigued with 5% sugar	0·0031	0·0026	0·0024	—
Fatigued with 20% sugar	0·0027	0·0024	0·0023	0·0018

All at 0·40 volt potential.

Usually if receptors are subjected to a stimulus they become fatigued. Such a case as a concentrated solution (20 per cent.) of sugar enhancing the sensitiveness of the sweet receptors is unusual. But the effect on neighbouring receptors is quite the opposite for they are usually made more sensitive. If the tip of a finger is lightly touched, that finger-tip becomes fatigued and less sensitive to touch, but the tip of the finger next to it becomes, by some reflex action, more sensitive. The first finger, before becoming exhausted, passes through the central system a message to its neighbour to be on the *qui vive*. Similarly, if the upper lip be lightly stroked with a brush the sensitivity of the lower lip to touch is temporarily enhanced. This phenomenon is known as induction. On account of it, it is impossible to stimulate any receptor without affecting those near to it. Consequently, when an attempt is made to count the hot, cold and touch sensitive spots on, say, the tongue, it is found that the counts vary and when the spots are mapped no consistency can be gained, due to the simultaneous effects of fatigue and induction.

A similar effect is found in the sense of vision.[76] For when one eye was stimulated with bright light, the three primary sensations, red, green and violet, in the other eye were enhanced in sensitiveness.

Having investigated the effect of fatigue on taste by first applying a taste stimulus to the side of the tongue to which the electrical stimuli were also applied, Allen and Weinberg then applied the taste stimulus to the opposite side of the tongue to which the electrical stimuli were applied and so investigated the effect of induction.

The left side of the tongue—*i.e.*, the opposite side to that in the electrodes—was stimulated as before with 1·5 per cent. acetic acid and it was found that the sensitivity of all receptors on the right side was enhanced. When a 20 per cent. solution of sodium chloride was used, again all receptors on the opposite side were made more sensitive. When the left side of the tongue was stimulated with 0·125 per cent. quinine bisulphate a paradoxical result was obtained, as all the receptors on the right side were depressed in sensitivity. The reason for this is not clear, but abnormalities in the bitter receptors had also been noted when the sour and salt stimulants were used. Durations of sensations were as follows, all at 0·40 volt potential :

	Duration in Seconds.			
	Sweet.	*Salt.*	*Sour.*	*Bitter.*
Normal	0·0028	0·0025	0·0023	0·0020
0·125% quinine bisulphate	0·0029	0·0026	0·0024	0·0021
1·5% acetic acid ...	0·0026	0·0023	0·0022	—
20% sodium chloride	0·0026	0·0024	0·0022	0·0019

From the table it will be seen that a bitter stimulus applied to the left side of the tongue has fatigued all the taste receptors on the right side of the tongue, but that sour and salt stimuli applied to the left side of the tongue has enhanced by induction the right side of the tongue.

Whilst all these results appear to have a general pattern running through them, that stimulus of receptors fatigues those receptors but enhances the sensitivity of adjacent receptors, there are some results which invite further investigation, notably the anomalous enhancement of the sweet sensation by a certain range of salt stimuli applied at the same side of the tongue, and the paradoxical depression of all receptors

by a bitter stimulus applied at the opposite side of the tongue. These results are bound to raise again the question whether there is only one type of end organ which is responsive to all taste stimuli, the different sensations being due to different degrees of stimulation, or whether there are four independent or partly independent gustatory end organs. The balance of the evidence at present points to the existence of four different types of receptors specific to sour, salt, sweet and bitter, and these receptors being connected through nerves and synapses, so that activity in one induces activity on a small scale in others adjacent to it. Some people have taste deficiencies, or at least greatly elevated thresholds of sensation, for certain substances, such as phenyl thiourea, which supports the view that the taste mechanism is made up of component parts, one of which may be missing in some persons.

In considering theories of taste we may bear in mind the following points:

(1) Actual contact of the sapid substance with the tongue or surrounding surfaces is necessary. We cannot taste at a distance.
(2) The receptors—the taste buds—are exposed on the surface, or are connected to the surface of the tongue by canals—the gustatory pores.
(3) The typical stimuli are concentrated aqueous solutions in contrast with the lipoid soluble substances which act as stimuli to olfaction. What is smelled is not generally tasted.
(4) Taste " fatigue " occurs on continued stimulus.
(5) Taste enhancement occurs by contrast or " induction "—for example, distilled water has a sweet taste immediately after we have experienced a sour taste.
(6) There are four well-established primary tastes.
(7) There is an optimum temperature of 20° to 40° C. for taste.

Renqvist[77] regarded the taste surfaces as a colloidal solution, in which the protoplasmic sensory particles and their components were suspended in the liquor or solution to be tasted. Then taste sensation would be due to adsorption, on the sensory particles, of the substance in the solution and equal degrees of sensation would correspond to adsorption of equal amounts. On this basis it would be expected that valency would be important, and it was found that the concentration of chlorides of divalent elements like barium and calcium was less than that of the chlorides of monovalent elements like sodium to give equal sensation, whilst the concentration of the chloride of aluminium (trivalent) necessary was still less. The phenomenon of taste differences between isomers is partly explained if the mechanism of taste involves adsorption, for it is well known that adsorption involves three-dimensional arrangement—for example, when a monomolecular layer of a fatty acid floats on water, with all the carboxylic groups anchored in the water and the long carbon chains rearing upwards from the surface. Such a theory of adsorption from a solution also goes some way to accounting for the many taste phenomena which appear to be due to ions. The adsorption potentials at the interfacial surface of a polar liquid and an oil were said to be due to accumulations of oppositely changed ions on the two sides of the interfacial surface by Ehrensvärd and Sillén,[78] who further suggested that such adsorption potentials probably play a part in taste and smell perception.

Lazarev[79] put forward a chemical theory. The papillæ are separately sensitive (this is open to question) to sweet, sour, salt and bitter stimuli, although some sweet substances may affect the sour, salt and bitter papillæ, so giving *nuances* of taste. Each papilla is supposed to contain a taste-sensitive substance which reacts chemically with and is decomposed by the appropriate sweet, sour, etc., stimulus to which it is sensitive. The decomposition product is then said to ionise and to excite the nerve terminals in the papilla.

Hahn[80] made experiments on adaptation in taste and presented evidence to show that taste is due to a monomolecular chemical reaction between the sapid substance and an unknown chemical substance situated as a substrate on the surface of the tongue.

Michael, who introduced the idea of " brightness " of taste and smell, notes that a taste may be " brighter " than any odour could be. With Limmer[81] he attempted to correlate the sensitivity of the tongue to sapid substances with the heats of solution of the sapid substances. The tongue is sensitive to temperature differences of 1° or 2° C. Since potassium nitrate and sodium bromide have very different heats of solution, it is possible by this means to distinguish a mixture of 5 KNO_3 95 NaBr from pure NaBr.

It will be seen that the three lines of attack are (1) adsorption, (2) chemical, (3) heat of solution. There is no reason why (3) should not be combined with (1) or (2) as a separate factor. That taste is primarily stimulated by a chemical reaction seems probable, and that ionisation plays a part is certain. It is equally certain that it is not entirely chemical or stereoisomers could hardly have different tastes as they do have in many cases. Possibly molecular vibration (*cf.* Dyson's correlation of the Raman effect with odour) is the initial stimulus, but that it is followed by chemical action or adsorption or chemical orientation on the tongue is most likely.

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Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, September 1, page 312.

No.	*Date.* 1944.	PRICE FIXATION ORDERS
625	May 30.	Order amending the Potatoes (1943 Crop (Control and Prices) (No. 2) Order, 1943.
626	,, 31.	Order amending the Soft Fruit (Maximum Prices) Order, 1944.
660	June 5.	Cereal Fillers (Control and Maximum Prices) Order. Revokes S.R. & O. 1943 Nos. 545 and 629.
665	,, 7.	Order amending the Cherries (Maximum Prices) Order, 1944.
666	,, 7.	Order amending the Green Onions (Maximum Prices) Order, 1943.
718	,, 23.	Order amending the Soft Fruit (Maximum Prices) Order, 1944.
730	,, 28.	Plums (Maximum Prices) Order. Revokes S.R. & O. 1943 Nos. 857 and 1246.
752	,, 30.	*Imported Onions (Maximum Prices) Order.
753	,, 30.	*Home Grown Onions (Maximum Prices) Order. Revokes S.R. & O. 1943 No. 763.
763	July 3.	Meat Products, Canned Soup and Canned Meat (Control and Maximum Prices) Order. Revokes S.R. & O. 1941 No. 2021; 1942 No. 1381; and 1943 Nos. 299, 933, 1063 and 1477.
787	,, 10.	Barley (Control and Prices) (Great Britain) Order. Revokes S.R. & O. 1943 No. 975.
788	,, 10.	Dredge Corn (Control and Prices) (Great Britain) Order. Revokes S.R. & O. 1943 No. 972.
789	,, 10.	Oats (Control and Prices) (Great Britain) Order. Revokes S.R. and O. 1943 No. 974.
790	,, 10.	Rye (Control and Prices) (Great Britain) Order. Revokes S.R. & O. 1943 No. 973.
791	,, 10.	Wheat (Control and Prices) (Great Britain) Order. Revokes S.R. & O. 1943 No. 971.
797	,, 12.	Order amending the Feeding Stuffs (Maximum Prices) Order, 1943.
829	,, 17.	Order amending the Milk (Retail Prices) Order, 1940.
854	,, 19.	Barley (Control and Prices) (Northern Ireland) Order. Revokes S.R. & O. 1943 No. 1021.

* *These two S.R. & O.s together revoke S.R. & O. 1943 Nos. 1223 and 1719; and 1944 No. 596.*

No.	*Date.* 1944.	FISH
632	May 30.	Order amending the General Licence, May 5, 1944.
		FOOD STANDARDS
654	June 1.	Order amending the Food Standards (General Provisions) Order, 1944.
		GRAIN
717	,, 23.	Order amending the Home Grown Grain (Returns) (Great Britain) Order, 1943.
		MILK
673	June 12.	Directions supplementary to the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942.
725	,, 27.	Directions, supplementary to the Milk (Control of Supplies) Order, 1942, and the Milk (Control of Supplies) (Scotland) Order, 1942. Revokes S.R. & O. 1944 No. 673.
828/S38	July 17.	Milk Marketing (County of Moray) Order.
863/S41	,, 20.	Milk Marketing (County of Moray) (Charges) Order. (Emergency Powers [Defence] Act, 1939. S. 2.)
		OILS AND FATS
672	June 10.	Edible Oils and Fats (Control of Sales) Order. Revokes S.R. & O. 1943 Nos. 701 and 1451.
		POINTS RATIONING
706	June 20.	Order amending the Food (Points Rationing) (No. 3) Order, 1943.
		RATIONING
669	June 9.	Order amending the Food Rationing (General Provisions) Order, 1943, and the Soap (Licensing of Manufacturers and Rationing) (No. 2) Order, 1942.
		VEGETABLES
650	June 2.	Carrots (General Provisions) Order. Revokes S.R. & O. 1943 No. 39.
651	,, 2.	Order amending the New Potatoes (1944 Crop) Order, 1944.
653	,, 3.	Carrots (1944 Crop) (No. 1) Order.
699	,, 20.	Order amending the New Potatoes (1944 Crop) Order, 1944.

Revenue from Cannery Wastes*

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IN PAST years, the importance of conservation of all materials was not so essential as mass production of the major product. When waste materials could be disposed of with a minimum of cost, effort and pollution of streams, such disposal seemed more profitable than installation of the more or less expensive equipment necessary to manufacture by-products. Also, in many instances, commodities made from these by-products or of a similar nature were already on the market in sufficient amounts from tried and proven sources, so that the success of new, competing products seemed somewhat doubtful.

Potential Value of By-products

To-day, however, the entire picture is changed. Many of the by-products available from cannery wastes are now critical materials, due to curtailed imports and increasingly heavy war needs. High priorities are being given by the Government for equipment for those plants which may be able to produce essential materials. It would appear that this might be the golden opportunity for the canning industry to capitalise the situation and so firmly establish itself in the production of certain items that there will be no question of their survival in these fields at the end of the war.

Ten years ago the waste, plus disposal costs, from fruit and vegetable processing in the North-west amounted roughly to well over a million dollars annually. As production figures have climbed and prices for raw materials advanced so has grown the value of the potential by-products annually passing down the streams and rivers, or decomposing in huge compost dumps of this area.

In a survey dealing with this very problem in Oregon, figures tabulated when less than half the returns were complete indicated an annual tonnage of waste from berry products of something over 37,713 tons, from other fruits of 208,105 tons, and a total vegetable waste of over 2,356,381 tons, and a total of some 12 raw products tons of potential bonemeal from poultry packing plants in need of salvage. This does not include wastes from dehydration plants. Figures available when the survey is complete should be illuminating. From present reports, indications are that there is a very small percentage of waste with berries, that processed apples yield from 35 to 50 per cent. waste, apricots 15 per cent., peaches 36 per cent, pears 33 per cent., asparagus 50 per cent., snap beans 14 per cent., beets 33 per cent., corn, spinach and tomatoes 50 per cent. each.

The raw material cost to the processor is much greater when translated into units of finished product in instances where no profitable disposition has been made of so-called waste. Sime plants in Oregon are beginning to realise the possibilities of the processing of materials not utilised in the production of the major commodity. For instance, one plant processing beets disposes of 50 per cent. of the solid waste as cattle feed; two apple plants convert pomace and juice into alcohol for Government use; a third produces vinegar and a bland syrup for use by a leading cigarette manufacturing company for their product; three plants dump both pomace and juice. Spinach and bean processors dispose of a very small proportion of waste materials as stock food, and a very large percentage is not salvaged. Most other vegetable waste, according to present figures, is dumped. A few processors grind the waste; some put it through a hammer mill, and thence into local sewer systems; many haul it to dumps for disintegration or dump it immediately into streams. In one asparagus plant the butts (50 per cent. of the product) are returned to the farmer dried, where they may be spread on the ground and ploughed under for fertiliser. Some prune and pear waste is used as stock feed; no use has been reported for pits of any of the fruits processed, and pea culls only are salvaged for feed purposes, while the vines are mostly burned.

The Effluent Problem

Problems which arise from these practices are those immediately recognised to be of importance to each canner. Wastes may consist of large quantities of water containing fruit or vegetable skins, peelings, pods, vegetable fibres, seeds, juices, or the like. The solid materials, when passed into the stream directly, cause piling up of refuse with resultant putrefaction and probable injury to fish by accumulation of toxic substances, and strangulation due to lodging of suspended particles in the gills of the fish. These dangers may be avoided by screening, but the more serious problem is that of the dissolved organic material. This is in an unstable condition and tends to decompose. It either putrefies, which means it is converted into more stable compounds, many of which are toxic and are attended by objectionable odours, or it takes up oxygen to become stabilised. In small streams there is not enough water for the latter, which causes the putrefactive action to be the only one available to the waste. The quantities of water necessary for satisfactory oxidation to occur are stupendous. For example, dissolved organic wastes from tomato packing plants require a dilution of 100 parts of clear water to each unit of canning liquid, and pea blancher liquid requires a dilution of 1,200-1. Other product wastes require dilutions between these limits.

Since many foods processing wastes are much stronger than equal volumes of ordinary domestic sewages, and differ in chemical and other characteristics, discharge of this waste, untreated, into local sewers is seldom satisfactory.

Treatment processes to overcome sewer stoppage are

* Abstract from a Paper presented at Annual Meeting Northwest Canners Association, Seattle.

mechanical, chemical, biological, or combinations of these processes. The first step in any instance is the screening of visible solids from the waste. Treatment of liquid may be by ferrous sulphate, lime, or some other effective chemical which will precipitate organic compounds from the solution.

Now, when national shortages in foodstuffs are developing, when we are being warned that it will become our responsibiltiy to feed a large section of the world's people and domestic livestock until they can again support themselves, it is of urgent importance that we, as canners, waken to our responsibilities and add our bit to the solution of this problem—thereby not only doing our patriotic bit, but also increasing our profits, and lessening our fame as being the world's most extravagant people.

Exhausted Sugar Beet

Exhausted sugar beet pulp is not only a valuable source of cattle feed, but is as good a source of pectin as apple sauce. By-products of the apple processing industry include numerous commodities more or less well known. Valuable as a stock feed, the dehydrated cores and peels are offered in some communities as succulent competitor to the well-known corn silage for winter use. A large part of it, however, is used for the production of pectin. This is used in the manufacture of jellies, jams, preserves, fruit butters, and more recently as a substitute for plant gums in confections such as gum drops, or coated goods with jelly centres. It is also used as a stabiliser for certain bottled goods, preventing separation and imparting a generally improved appearance. It is also used as a base for some greaseless pharmaceuticals and as a stabiliser in emulsions.

Apple By-product

Apple flour is another product, not well known, but valuable in the medicinal world as well as a supplement to grain flour products. It is known that the therapeutic effect of this product is due to its pectin content, specifically to the galacturonic acid fraction of the pectin.

The waxy coat of apples, pears, and such fruits hold possibilities which may bear investigation. It is composed of organic esters which give the fruits their characteristic odours and carries the vitamins A and D. Figures on the quantities of these vitamins available from such waxes have not been published—but such a study might prove valuable.

Apple wax, made from the pomace and cuticle of the fruit by extraction with white petroleum ether, is a white substance, with no evidence of ketone present, but consisting largely of the hydrocarbon N-nonocosane. It has a melting point of 65·1° F. and yields a secondary alcohol of 10 nonocosanes. It apparently has a small fatty acid content. Such hydrocarbons, when combined with glycerides, have been used in lubricants. Other uses are doubtless awaiting discovery.

Possibilities for the use of wax and oil from pears (isoamyl acetate) might include their use in medicines, manufacture of candles, and in furniture polish.

Apple and pear seeds, also, are a potential source of oil. The oil content of the apple and pear seed is about 22 to 25 per cent. of the seed weight. The oil is colourless, odourless, and possesses a tart flavour. To some, it somewhat resembles the flavour of beechnuts. Although the oil content is high, extraction costs have been so high as to make production impractical in normal times. Under present conditions, the study might be reviewed with possible advantage. As an indication of its properties, its acid number is 24; saponification number, 178; ester number, 154; iodine number, 104; its glycerol content, 8·4 per cent.; and the unsaturated acids present are oleic and linolic.

Other uses for cores, peels, and sub-standard fruits, include production of vinegars, juice, still or carbonated, sweet cider, syrups for bakers' flavourings and sundæ toppings or for home use on waffles—as well as the aforementioned cigarette ingredient.

Lately much of the apple pomace has been going into alcohol for Government purposes—pears also are a good source of this product. Apple juice ranges from 9·13 to 10·69 per cent. sugar after inversion. In the Western area, exclusive of California, a 1942 crop of 35,178,000 bushels was produced. Conservatively estimating a 45 per cent. utilisation of the crop by processing in one form or another, there would be a potential of 262,445,680 lbs. of waste (35,178,000 × 48 × 0·45 × 0·35). An average of 10 per cent. sugar would indicate a possible 26,244,568 lbs. of sugar available for alcohol, were the entire waste utilised. Pears, likewise, are rich in sugar. Manufacture of alcohol from pears shows profitable utilisation of this pear sugar.

Carbon Dioxide

The carbon dioxide developed in the process of making alcohol may well be an added source of income, for it will be readily usuable in low temperature storage and sharp freezing plants. This industry promises to be expanded rapidly after the war and should offer a ready outlet for all carbon dioxide produced. Carbon dioxide sales will add to the profit from culls.

Another use for surplus carbon dioxide is in its addition to fruits, including pears, in storage or shipment. It has been proven that the storage life of pears is increased by the replacement of 35 per cent. of the atmosphere by carbon dioxide.

Pears may also be fermented and various products made from this treatment. Vitamin B_1 probably leads the list in importance, with glycerol, acetone, butyl-alcohol, manite, amyl-alcohol, pyruvic acid and carbon dioxide all possible as well.

Yeast manufacture is not difficult. With the larger tonnage of pears available, cull pears alone should yield over $306,000 annually in Oregon based on the 1942 production, and continuing the average price of 10 per cent. received for yeast before the war.

Cherry production in Oregon in 1942 reached a tonnage of 21,000 tons. In the Pacific North-west that year the total was 52,610 tons. If 15 per cent. of cherry weight is pit, then there were 1,578,300 lbs. of pits, 28 per cent. of which—or 441,924 lbs.—were kernel, which, estimating a 30 per cent. yield of oil, would give 132,577 lbs. of oil from cherry pit waste. The cherry briners have an annual pack of some 56,000 barrels. The average price for barrelled brined cherries is approximately $37·50 per barrel. In other words, the briners annually purchase (0·15 × 56,000 × 37·50) $315,000 of produce which has been of no value to him. It would seem that more profitable use of

this waste might be made by the briners by utilising this oil.

Seven thousand three hundred tons of Royal Anne cherries were canned in 1942, in most cases whole, approximately 2,190,000 lbs. of these being pits. Again, there were available 18,396 lbs. of potential oil.

Some 133,100 tons of plums and fresh prunes were harvested in 1942. Thirty-seven per cent. of these were canned, 7,200 tons, dry weight, were dehydrated, and the rest were sold fresh. Prune pits are 10 to 15 per cent. kernel, and the kernel is 30 per cent. oil by weight. Pitted, those canned and dried represent a potential of 492,576 lbs. of oil, were the pits to be removed. Practically, however, consumers have grown to expect and appreciate the product which includes the pit as well as the fruit.

Taken alone, exclusive of potential prune pit oil, these oil amounts do not sound imposing, yet more than half a million pounds of oil is no insignificant amount at this time. While the raw oil is often high in free fatty acid, dark in colour and rancid in flavour, it may be refined by treatment with a small amount of sodium carbonate to neutralise the free acid, by adding fullers' earth or bone char to decolorise it, and by heating it to volatilise objectionable odours.

Uses for Refined Oil

The refined oil finds a market for use in the preparation of face creams and pharmaceuticals, as table oil, and in sardine packing plants.

The principal compound in these oils is olein, $C_3H_5(C_{17}H_{33}CO_2)_3$, with small amounts of stearin and palmitin, both solid fats, present also.

The hard covering of the kernel, likewise, may well be investigated for a source of wood flour for plastic preparations.

The press cake remaining from the extraction of the sweet oil contains the bitter principle, amygdalin, and the enzyme emulsin, which converts amygdalin to benzaldehyde, glucose and hydrocyanic acid. Benzaldehyde gives the characteristic odour and flavour to bitter almond oil and wild cherry flavouring extract. Extraction of the amygdalin from the press cake is not difficult. The prussic acid may be removed from the oil quite simply, also, when the oil is to be used for flavouring purposes.

Apricot kernels are now the basis for much of the macaroon paste, once made chiefly from sweet almonds. This paste is made from ground kernels from which the amygdalin and prussic acid have been removed, and to which sugar has been added.

Press cake from which the oil has been removed may be used for stock foods. It is high in carbohydrates and protein. Cherry kernel cake has 30·87 per cent. protein, 42·13 per cent. nitrogen (free extract), 8·9 per cent. crude fibre, and 13·1 per cent. other extract. It has more protein than cocoanut, but a little less than cottonseed meal. Press cake from apricot, peach and prune seeds is thought to be similar in composition.

In the areas where these fruits are produced there is another potential source of revenue—not to the canner, but to the producer. However, it is one which is closely related to the industry, and of passing interest to the fruit processor. In four areas of the United States and Canada in which large volumes of fruit are produced annually, it is estimated there are 2 million tons of tree prunings available. The 2 million tons of waste prunings yearly could be converted into 6,000 tons of fine paper pulp. On well-kept orchards there are as many as 1,500 to 4,000 lbs. of prunings per area per year. Pulp from these woods may be converted into fine grades of paper, such as used for air mail, tissue, cigarette and coated papers and for better magazines and Bibles as well. This paper is white, opaque, has a good printing surface and is resistant to folding or handling.

A waste product, pruned from good healthy wood, this wood can be baled and hauled to centrally located mills without the expense of establishing camps, building roads or railroads, or frequent change of location, since most orchards are more or less permanent.

Vegetable wastes have not received their share of study and present a challenge to cannery chemists.

Some of the studies which have been made include waste products of the tomato, pea, and asparagus packing industries.

Waste materials from manufactured tomato products varies from 15 to 30 per cent. of the original weight of the product. Most of this waste consists of skins, seeds, and hard tissue. Italians use dried tomato waste as a cattle feed. Rabak reported that American-grown tomatoes contain an average of 1·13 per cent. of dry waste from the pulping operation, of which 46·1 per cent. is seeds. Finks and Johns (1921) studied the nutritive value of the proteins of tomato seeds and tomato seed press cake. The seeds contain 22 per cent. of oil suitable for table use, and the press cake which remains after the oil is expelled contains approximately 37 per cent. protein. This indicates that tomato seedpress cake is as valuable a protein concentrate as peanut, soy bean or cocoanut press cake. The basically essential amino acids are well represented in the tomato seed press cake as are relatively large amounts of arginine, cystine, histidine, and lysine.

There are approximately 6·8 international units of vitamin A per gram in dried tomato waste, 4·0 units of vitamin B_1, and 3 units of B_2. A small amount of vitamin C is also present.

When fed with grains, a 10 to 11 per cent. proportion of dried tomato pomace was found to be palatable to animals and poultry. A greater amount tends to give a bitter flavour to the feed, which would cause the feed to be less readily consumed.

It is not economically wise for individual canneries to establish their own manufacture of the oil and press cake. It would be wiser for each to dry the pomace from its own processing and ship it to a centrally located plant for conversion to oil and stock feed.

Pea growers are using cull peas for cattle feeds; the vines make good hay ensilage and fertiliser. A further possibility which should be developed is pea-pod meal. These pods have a protein content of 16·7 per cent., are 60·20 per cent. nitrogen free, 17 per cent. fibre, and 6 per cent. ash. They have a lime content of 1·52 per cent., potash content 1·47 per cent., are 7·7 per cent. invert sugar and 9·3 per cent. moisture. This meal, when used in combination with other meals or grains, makes a good supplement to feed supplies.

These, then, are some of the possibilities for the use of plant wastes which have been developed. This is only a beginning and should be a challenge to our ingenuity to make something of those things once con-

(*Continued on page 368*)

Relief Administration—Soviet Model

We are already facing the problem of the provision of food to liberated communities. How extensive the problem will be we can scarcely estimate at this stage. Estimates certainly exist since their submission is a necessary function of the Relief Administration, but they have to be modified from month to month. This article is concerned solely with the machinery for relief and agricultural rehabilitation evolved on the Soviet front.

F. Le GROS CLARK, M.A.

THE PROBLEM is fundamentally the same as our own, but the Soviet solution has obviously had to be applied on a far larger scale and doubtless tested by experience. There is, of course, a distinction. The Russians have been liberated by their own armies; this cannot but possess a psychological advantage. Moreover, the Soviet authorities have obviously initiated a campaign among the vast communities of the interior, calculated to tap the springs of generous and open-handed enthusiasm, and this campaign has found a ready response. But the basic problems remain the same.

The extreme of German occupation deprived the Union both of the Ukraine and of the fertile areas of the Kuban and the North Caucasus. The loss was a serious one. The rapid development of grain production in the regions beyond the Volga, that had taken place from 1932 onwards, certainly provided the Union with a firm wheat basis for its war effort, and fresh expansion of the ploughed area was possible, since the reserve of tractors and harvesters beyond the Volga was adequate. The Union must further have begun the war with fairly satisfactory grain stocks in hand, judging by the pre-war harvests. But she relied on the Ukraine for at least 70 per cent. of her sugar.

There were further technical difficulties. Both the Ukraine and the Kuban are normally surplus wheat areas, upon which both the northern regions of European Russia and the petrol republics south of the Caucasus partly depended. They were also better supplied with railways than were the republics of the interior; and petrol for the farm machinery could be readily shipped by sea from Georgia.

Destruction of Livestock

In brief, the extreme of German advance by the winter of 1942 had probably deprived the Russians of about 40 per cent. of their total grain acreage; their losses in cattle, too, may have been as high as 40 per cent. and of pigs 60 per cent. It was plain to the authorities from the earliest days of the invasion that, whatever might be the condition of the soil and the crops when they had expelled the invaders, nothing could prevent a serious destruction of livestock. Breeding strains were evacuated, so far as was possible; and steps were taken to raise livestock production in the interior, particularly through the concentration of herds under specialist management and by the use of artificial insemination. While these measures and the plough-up policy of the interior were pursued with some success, there is no space here to follow them in any detail. The Union had in the main to rely upon its own soil to make good its deficiencies; and these were increased both by the withdrawal of man-power from the farms and by the evacuation to the east.

The lease-land food drawn from America has made a significant but not an impressive contribution; and most of it has gone to the armed forces, though a little has been diverted to the children and the military hospitals. Down to the beginning of 1944 the United States sent some 2¼ million tons of food, including more than 600,000 tons of butter and other fats and oils and large consignments of pork. The increasingly serious food situation early in 1943 had led to an acceleration of deliveries, so that in fact some 75 per cent. of the total was despatched in that year.

The Urgency of Production

The Soviet policy for its liberated territory has been clearly defined; the territory must be brought back into production at all costs as soon as possible. This, too, is necessarily the policy of the Allies in Europe, and it must be the policy pursued wherever famine or near famine is threatened. Stocks of seed grain were accumulated behind the front; and in the course of 1943 consignments of about 9,000 tons of seed grain were sent from the States. At the same time farmers in the unoccupied areas were encouraged to share their seed with their liberated brothers of the west. But the west is an area of large industrial concentrations; and though the industrial population had been reduced by evacuation it was still significant. Industries had also to be restored and the population fed. The total population of the west has probably been reduced, though to what extent it is still difficult to estimate. Leningrad's 3 million was perhaps not more than half that figure by the time its surplus inhabitants had been removed; and of those that remained, disease, hunger and bombardment took their toll during the long siege. Kiev was stated on its liberation to possess no more than a fifth of its pre-war 850,000 inhabitants; and of Odessa's 600,000 somewhere between 100,000 and 200,000 are said to have been massacred after the town fell. Nevertheless, the losses in the countryside must have been of a far lower order; and doubtless there has been a reflux into the restored industries both from the interior and from those who had taken refuge either in the villages or among the guerrilla detachments.

Methods of Restoration of Farm Production

The Soviet method on entering a town seems quite consistent. A military authority is, of course, established immediately; but the personnel of civil control

usually enter the town with the troops or within a day or so of liberation. For example, the military commandant of Smolensk in October, 1943, shortly after its reoccupation, had the primary charge of feeding and clothing the population and of providing shelter, but he co-operated with the civil authorities in every detail, and it was in consultation with them that he took steps in the surrounding region to restore the movement of farm production. Food was naturally the first consideration. It was usually assumed that stocks would have been destroyed or removed; and the practice was to hold trainloads of wheat and flour in readiness at the approaches to the town, so that they could follow the advancing troops.

Presumably the equipment for bakeries and for communal kitchens was also among the early priorities. Invariably the first plants to be restored in the large centres have been the mechanised bakeries. In Kharkov, while German shells were still bursting over the city, bakeries were being re-equipped. A few of them were doubtless still in operation when the Russians entered; but by the close of October there were twenty at work; a further ten were practically ready, together with a plant for producing baking equipment. In Stalino, which was liberated early in the September of 1943, there were twenty-three bakeries at work by the middle of October.

Public Dining Halls

The opening of public dining-halls has always been one of the immediate measures taken by the newly established Soviet authority. The Union possesses considerable reserves both of equipment and kitchen labour, which can be mobilised from elsewhere for the purpose. By the January of 1944 there were some 1,840 such dining-halls in Kiev. It is noticeable that the number of shops opened in this city was far smaller, and it seems clear that it has often taken some time to re-establish the normal processes of trade. By October, 1943, Kharkov had 62 dining-rooms opened for about 50,000 of its factory and office workers, together with others catering for the general public. By the same date, too, Kharkov had managed to reopen 48 grocers' shops. Taganrog had 13 dining-rooms by the September of that year. Proportionately the catering arrangements seem to have been of this character in most of the liberated towns. But further, wherever it has been possible, steps have been taken to bring the food factories and processing plants back into operation. After a month of its liberation in October, 1943, the town of Dniepropetrovsk had already a flour-mill that was doubling its anticipated output, while a cereal processing plant and a sausage factory were at work. Kharkov's large meat combine had probably not suffered serious damage; for it had been brought back into production a month after reoccupation. Meanwhile the restoration of the meat-processing plants in the territories earlier released had been going forward. By the summer of 1944 they were again at work in Sverdlovsk, Voronezh, Krasnodar and Kursk; and there was a sausage factory also in Taganrog. An estimate at that period suggests that some 45 meat combines and 180 butter and cheese factories had been brought back into production in the liberated areas that lie east and north of the Ukraine. This is a reasonable proportion of the pre-war capacity, though the loss of livestock must seriously have reduced the through-put.

Fall in Livestock Population

There are as yet no final figures on which to compute the fall in the livestock population experienced by the Union; but such figures as there are show that the Germans not merely lived off the land but indulged during their retreat in the mass slaughter of farm animals. For example, the farms of the prosperous Kirovograd region west of the Dnieper had before the war possessed some 180,000 head of cattle; only 2,111 cattle were found after the German withdrawal. The loss of pigs and sheep was at least proportionate. In the Odessa region about 87,000 head of cattle and about 45,000 horses are stated to have been shipped into Rumania. Stavropol in the Northern Caucasus had been liberated early in 1943; the loss of horses is stated to have reached 60 per cent., while the loss of cattle, amounting to 3,250,000 head, cannot have been less than 70 per cent. of the original herds. In some regions the destruction of poultry seems to have been even more extreme. Possibly these instances are among the most serious; but when we assess all the available evidence, it is difficult to escape the conclusion that the occupied areas lost, in varying degrees from region to region and from stock to stock, some 60 to 80 per cent. of their farm animals.

We embrace in this figure both the livestock held collectively by the farms and those animals, frequently a fair proportion of the total, in the private possession of the collective farmers. The figures recorded usually refer only to the collective herds; but here evidently the losses had been excessive.

Return of Evacuated Livestock

By the late autumn of 1943 the organised return of evacuated stock from the interior was in progress; the preparations were detailed and particular. Routing by rail and road and, where possible, by water was carefully planned, so that fodder might be available; by the close of October the total migration was said to have reached a figure of 600,000 head of stock. In 1944 the process was continued, and long-term credits were advanced for the acquisition of fresh stock. The total projected supply of poultry is stated at about 10,000,000 head in the current year; to facilitate this 75 new incubator farms are being established. By March last it was reckoned that in the Ukraine east of the Dnieper, which was the area liberated in the course of 1943, there would be by the close of 1944 some 680,000 cattle on the collective farms, some 210,000 pigs and 250,000 sheep. This is not a high figure. It cannot be reckoned as more than 10 per cent. of the pre-war herds of the area. But every effort is plainly being made to increase the rate of breeding; the speed with which the almost empty cattle-sheds and dairy farms have been rebuilt shows how seriously the authorities are taking the problem in hand.

Marketable Surpluses

The returning armies usually found a harvest either gathered or still in the fields. But only in some measure could a marketable surplus be expected, over and above the basic requirements of the farming community. In the regions of the Ukraine, that were reoccupied during 1943, at least 20 per cent. of the farming collectives had to be exempted partly or wholly from deliveries of grain to the market; 23 per cent.

were excused any delivery of potatoes and 27 per cent. deliveries of other vegetables. Production of milk and meat was naturally of a low order, though certain quantities were evidently beginning to reach the market even from the depleted herds.

The farming practice of Russia has in late years concentrated about the use of the tractor and the harvester; and this spread of mechanisation was the core around which the collective farm was organised and the channel through which the practice of scientific farming could be conveyed to the countryside. It was therefore a matter of serious concern to the authorities to discover how far the machinery had suffered under the occupation. On an average at least two-thirds of the tractors had been destroyed by the Germans during or before their withdrawal. They had themselves been able to make little use of the machinery even had they found the drivers willing to work for them; they were entirely unable to provide either the fuel or the spare parts required; and in any case many of the skilled drivers had been called to the colours. While the Soviet authorities had not managed to evacuate more than a few thousand out of the scores of thousands of tractors dispersed over this vast area, they had made some preparation for meeting the likely deficiency, especially by creating reserves of machine tools and equipment for the repair shops, training women and boys as drivers and diverting some of their industry to the manufacture of machine parts. As a result, it was found possible to undertake a campaign of reconstruction on a large scale.

Speed of Rehabilitation

It is, we may note, naturally easier to liquidate machinery and processing plants than stocks of grain or roots. Beets and potatoes are not readily destructible, unless one gives time to it; and grain in store will scorch on the more exposed parts but remain intact in the interior, unless again some time is devoted to the process. The Germans rarely had sufficient time; but they could blow up repair shops and plants. An estimate of last spring shows that more than two-thirds of the sugar-refining plants of south Russia were destroyed in the occupation; and this has necessarily created a serious bottle-neck in production. At the close of 1943 only 28 of the refineries could be brought into commission for the processing campaign; but the efforts of 1944 will, it is said, have 150 plants at the disposal of the Government by next beet harvest; and in many cases their capacity has been enlarged. If the sowing has been satisfactory, as the reports seem to indicate, the produce of the liberated areas together with the extensive new sugar-beet bases of Asiatic Russia should provide the Union with a fair proportion of its sugar requirements.

The tractor repair shops were the more important, because, as it happened, a number of tractors or tractor parts had been buried or concealed by the farmers. It was possible to reassemble and overhaul. In the Crimea, for instance, which was reoccupied early in the present year, some 700 tractors and about 1,000 combines were assembled, in many cases literally out of scrap. The region had been one of high mechanisation; and the speed of rehabilitation is suggested by the report that the crops area had already reached almost 70 per cent. of its pre-war dimensions.

Elsewhere, however, extensive use had to be made of draught animals of any description.

The Collective System

It is clear that in the restoration of agriculture every European country has to follow its own course, dependent upon the structure of its farming economy and the reserves of skilled labour upon which it can draw. The collective farm system had ten years before the war in which to mature, and it seems to have stood the present ordeal remarkably well. Had the war come earlier, its structure might still have been somewhat brittle; the collective farms might not have had time to develop their experienced organisers, managers and agronomists; and the old independent peasant holding would have been in a state of uneasy transition. But, as it is, a large proportion of the strongest adherents of the collective system became leaders of guerrilla bands and maintained their influence over the countryside. They returned to reorganise their farms; and to them were added such reserves of skilled mechanics, drivers and specialists as the Government could spare. The whole framework of the collective system was restored as rapidly as possible; even lorries and tractors were often temporarily diverted from army uses to work in the fields.

From this brief consideration of the technical problems of relief, as they affect the Soviet front, it is possible to draw a few obvious conclusions. To secure the feeding of the towns and the industrial areas from the surplus of the countryside it is necessary to convince the countryside that food is already accessible. Probably conditions in Russia would have prohibited the emergence of any form of a "black market"; but it is always a potential danger, where the farmer sees the chance of holding up supplies in the hope of a demand that will raise prices. To prevent this the Russians have invariably held supplies in readiness for distribution, and have encouraged the restoration of farming to the point where an increasing surplus could be maintained by the offer of fair and stable prices on the market. They have further, as is evident, supplied the farming communities with whatever share of consumers' goods was available and have advanced large credits for the re-equipment of farms. Lastly, they have supplied machinery as far as they could, an important factor for us to have in mind in facing the problem of raising the productive level on the Continent of Europe.

Revenue from Cannery Wastes

(*Continued from page* 365)

sidered only fit for sewage. Soon we should devise some way to save the flavouring materials of all vegetables, minerals, and riboflavin of leafy vegetables, pectins of root vegetables, the carotene of carrots and spinach, and the oils in the seeds, waxes in the cuticles, and the volatile oils of the cruciferæ. Too long we have been content to save only the major item resultant from the manufacturing process—now it is time to look for our profit from the lesser products, and in so doing conserve the valuable foods for our own consumption rather than use them to clog the sewers and pollute the streams as has been done in the past.

Potato Spells History

M. SCHOFIELD, M.A.

POTATOES are the best insurance against starvation in war-time; they produce more food to the acre than any other farm crop. That they probably saved the food situation for this country during the U-boats menace, serves as a reminder of the influence of the potato on European history during the last century or two. "Europe is dependent to an increasing extent on vegetable rather than on animal products," is but a repetition, an emphasis oft repeated in times of war, that the potato is the last stand-by, the final barrier against starvation. The last war saw a Germany of 1916 so reduced by blockade that a civilian could buy in the open market only 10 ozs. bread, 1 oz. sugar, 2 oz. meat, ½ oz. fat—together with 13 ozs. potatoes, let it be noted. Any excess above this had to be obtained in the "black market" (the *Sleich-handel*, as it was appropriately named), an evil not so new as some people imagine. Though Germany's Mackensen, the Rommel of his day, quickly conquered Roumania and its wheat, thereby relieving the position temporarily, by 1918 the position was yet more critical with rationing so severe that a man could (and often did) conserve his energy on a daily allotment of 1,700 calories simply by staying in bed—which is no way to win a war! Potatoes delayed total collapse, however, just as in our own country they helped in wartime bread to make up starch deficiencies, and, what is more important, proved the protector of the British population against scurvy (except in 1916, when a failure in the potato crop brought some scurvy to some of our towns).

An Essential Crop

In all this "digging for victory" which tided us over the U-boat menace during recent years the common potato was (and is) regarded as an essential though unexciting crop of any wartime allotment. "A useful if dull article of food." That is the verdict of our national encyclopædia and of a British public unaware of the vital part played by the potato in the Germany and Austria of 1914-19. Furthermore, any article on this commodity needs rewriting when it fails to refer to Parmentier, when it has become out of date with the further unfolding of potato history by Dr. Salaman, F.R.S. The opening chapter of the potato's *début* in Europe—from which time were sown the first seeds of its influence on European history and economics—is one of controversy so much in evidence as to justify Thomas Moore's jibe:

> I'm a careless potato and care not a pin
> How into existence I came;
> If they planted me drill-wise or dribbled me in,
> To me 'tis exacty the same.

Should Raleigh be praised merely as cultivator, since his ships never went to Peru, home of the potato? Did Sir John Hawkins introduce the potato from Santa Fé, or was it that aphrodisiac, the sweet potato, for which Falstaff cried in "The Merry Wives of Windsor," which he brought? In any case, was it the right Santa Fé that he went to? Or was Germany right when she gave Drake the honour, erecting at Offenbach a monument to the "Introducer of the Potato into Europe in the Year of Our Lord 1580"; when she struck a medal in the last war to the British Admiral as saviour of Germany, when a large potato crop enabled her to hold out another year and necessitated further slaughter? There were no potatoes or mention of them on board *The Pelican*, nor reference to them on the menu for the banquet given by Drake for Queen Elizabeth.

An Unsolved Controversy

Though Drake and Raleigh had some say in the introduction, despite a modern tendency to "debunk" them, the controversy remains unsolved. Yet certain facts remain firmly established, while the first cultivation has been "stepped back" by some centuries by Dr. Salaman. Instead of all this singing the praises of "Pedro the Fisherman," let us salute Pedro Creça, who in the *Cronica de Peru* published in Seville in 1553 first refers to "papa" or "battata." Kasper Bauhin in 1596 accurately described it and called it *Solanum tuberosum* (of which Linnæus seemed to approve); while John Gerard in his Herball of 1597 gave it the name which every gardener knows, a woodcut showing "*Battata virginiana sive Virginianorum et Pappus*, Potatoes of Virginia." The first record of European growing is now 1572, Seville, so that it popped up 15 years earlier than is usually recorded.

Centuries before the potato exerted its influence on the fortunes of Germany, France and Ireland in particular the tuber had proved a vital stand-by to ancient civilisations. Wherever man won a foothold high up on the Andes, there did he plant his potatoes, frost-hardy and available when other crops failed. So Dr. Salaman tells us in tracing the tale of the potato to at least A.D. 200, to the Inca civilisations, to those Indians who made sacrifices "for the sake of the potato" to a potato "spirit" they regarded as stronger than any Irish whisky! Other writers had told of the succession of cemeteries along the arid desert of the Pacific coast between Peru and North Chile, of cemeteries with funeral vases of terra-cotta depicting staple foods and fruits of such ancient peoples. Surviving the centuries on pre-Spanish graves on a rainless coast, such pottery described by Dr. Salaman was the material for a striking naturalism among primitive artists who pictured so well the oldest form of potato, blood-red with deep eyes often surmounted by a brow. Agreeing with Vavilov, Bukasar and other Russians who led expeditions to Peru, home of the potato, whenever information on hardy varieties was sought, Dr. Salaman traces the birth of potato cultivation to two regions: to the plateaux of Peru and Bolivia, and to Chile and the Isle of Chiloe. There did man begin a history, knowing he could rely on the potato as food. There in later days did he make his "chuño," one of

the earliest preserved foods, by treading down potatoes to squeeze out moisture and drying them for times of need.

Developments in Europe

To return to developments in Europe brings Germany and France well into the foreground. Famine followed the Silesian Wars, especially the Seven Years' War, so that potato cultivation became the rage in Prussia. In 1651 Frederick William had hinted at its importance when he had potatoes planted in the Berlin Lustgarten. Later his grandson did more than hint when he threatened to cut off noses and ears of all who refused to plant potatoes. It so happened that a prisoner at Hanover during the Seven Years' War was Antoine August Parmentier, a modest Frenchman unheard of then, and unheard of since where much concerning potatoes has been written. This prisoner liked the potatoes in his prison diet, and remembered them in 1771 when the Academy of Besançon offered a prize for a new foodstuff to replace cereals in times of war and famine. The next year Parmentier presented his report.

In all the publicity given to great names in French history, how much has been written of Pasteur; how little of men like Nicolas Appert, that modest Frenchman who discovered the art of sealing the seasons, who pasteurised milk before Pasteur did, who provided man with tinned foods enabling him to undertake any hazard like Polar or Everest expeditions. And how little one hears of Parmentier, economist and physician to the Invalides, to whom Louis XVI addressed words of such telling significance to a country on the verge of starvation to-day: "France will one day thank you for having found bread for the poor." Parmentier is perpetuated in nothing more than *Hachis Parmentier*, in that "Shepherd's Pie" with fancy top which often surprises the highbrow who deems any food superior if it has a Continental caption. This Frenchman showed his potatoes to the king, who granted him a patch of land for potato growing which was guarded by a cordon of troops—a useful advertisement. On the sandy soil of Neuilly Parmentier planted considerable acreages of potatoes. Queen Marie Antoinette wore flowers in her hair in the evening; the king wore them in his buttonhole; the Paris florists did a brisk trade with the dandies. And France, the France of 1914-1919 and of 1939 onwards, was assured of at least a bare sustenance in days when disaster overtook her. Potato flowers still bloom (one hopes) in their season on that grave in the great Père Lachaise cemetery.

The Potato in Great Britain and Ireland

After continental Europe, can one find any such influence of the potato in Great Britain and Ireland? One can certainly find both bright and grim sides to the picture after 1588, when the potato first came to Ireland to spread rapidly, with soil and climate so suitable, and to bring widespread famine when crops failed through blight. Dr. Salaman has told how Irish labour became exceptionally cheap when the Irish peasantry maintained their hold on the land in little holdings paid for by miserable wages. A miserable standard of living, often starvation, begging, heavy drinking—drinking because diet was monotonous, because a spirit could so easily be won from the potato. Such were Ireland's lot, factors explaining emigration and influencing much of her history, including even hostility towards England. They relied, remarked Dr. Salaman, too much on "a single cheaply produced and nutritionally adequate food."

In England one or two contributions to the tale of the potato are significant. The year 1664 brought a beginning, a year in which only a few kitchen gardens had potato "patches," despite the scarcity at times of corn and rye. In that year not only did the Royal Society sponsor potato cultivation, asking Fellows to plant them, but the year brought John Forster's book "England's Happiness Increased, or a Sure and Easie Remedy against all succeeding Dear Years; by a Plantation of the Roots called Potatoes." He suggested Irish potatoes: "First, if it shall please His Majesty to command that there be brought out of Ireland so many of the said Roots"; and told how easily *Solanum tuberosum* could be grown by poor people for times when corn was scarce. How very near Forster came to becoming a Parmentier in a country noted for dislike of innovations! The next century brought a second prophet crying in the wilderness; this time in R. Bradley, who, in his *General Treatise of Husbandry and Gardening*, considered "how much Profit they bring to a Family. I wonder they are not more generally propagated in the poorer parts of the Country." Nevertheless, Northern England had begun to learn the lesson, for the potato began to be a mainstay in the diet of the poor. At the end of this century Arthur Young, Secretary of the Board of Agriculture, caused a report to be circulated on the merits of potato cultivation. In contrast, there was much prejudice to live down, prejudice like that of William Cobbett, who in his *Rural Rides* deplored the spread of potato-growing ("the poor creatures digging up their little plats of potatoes") long after the potato had been introduced "by one of the greatest villains on earth." But writers of just a century ago were in a different mood, telling how the poor of our northern industrial towns eked out a living on "potatoes and porridge," on "a small bit of bacon cut up with potatoes." A year later, in 1845, the disastrous epidemic of potato disease brought starvation and scurvy.

No mention of potato disease and its consequence to the welfare of our populations should be made without one final striking figure in the English scene being introduced. John Snell, of the Ministry of Agriculture, won his spurs at Ormskirk in a workhouse garden as worthy of fame as that monastery garden at Brunn where Mendel worked, just as Parmentier won his battle at Neuilly. This shift in the tale of the potato from genteel Paris suburb to Lancashire, home of the chipped potato (wrapped in yesterday's news, yet sustaining Lancashire to-day), and of the potato crisp (one-time *pommes de terre châteaux* of smart Paris restaurant), is a final thrust at those who deem the potato a "dull" subject. For Snell deliberately chose a battlefield attacked by every pest and blight blown on humble potato, including "black leg," so misnamed since it is an active member of the union of pests, and the Colorado beetle, which had crossed continents. There did Snell make innumerable trials to breed hardy potatoes, to breed as near as possible the perfect potato withstanding disease. Potato growers and breeders flocked to Lancashire to hear of genetics and virus research, which ensured full development for the old tuber from Peru; to hear this man on whom the mantle of Parmentier had fallen.

Trade News

A New Protective Lining for Metal

To those handling materials of corrosive nature a new coating for metal will be of interest. "Prodor-Glas" is basically an improved synthetic resinous material of the phenol-formaldehyde group. It is applied to metals and subjected to a special stoving process. The low temperature involved in this process enables the lining or coating to be applied to light-gauge metal articles; this reduction of weight is of particular importance in the bulk transportation of liquids.

The material is durable and tough and has a high gloss. Chemically inert, it resists attack by acids, salts, solvents, brines, foodstuffs, etc., and can be applied to metal plant and equipment for use in the milk, mineral water, beer and many other industries.

Prodor-Glas has been evolved to withstand mild alkaline detergents.

* * *

Montrose Success in New Industry

Mr. Tom Johnston, Scottish Secretary, visiting Montrose, made a tour of inspection of the factory of Messrs. Chivers and Sons, Ltd. He was received and conducted over the buildings by Mr. W. B. Chivers, chairman of directors, and Mr. J. R. Anderson, the resident manager. After lunch at the works, at which Provost Ritchie and Mr. R. A. Barrowman, Town Clerk, were also guests, Mr. Johnston addressed the employees.

He said this was the first effort in all the world to dehydrate potatoes. He was glad to know it had been exceedingly successful. Indeed, when the war was over they were assured that here was a permanent post-war employment. It was a new industry for Scotland and would have a great effect on agriculture.

On behalf of the Council of State in Scotland he would like to congratulate Montrose on being the venue in which this great experiment in nutrition had been started.

Call up of Sawyers Limiting Production

The last call-up of sawyers is now making itself felt in production returns, according to a Scottish sawmiller and packing-case maker, who indicates that labour in this sphere particularly remains by far the greater problem in the industry. When the reservations were lifted it was pointed out by firms that production must suffer, and this has been proved the case. The Ministry agreed that such must be the effect of their withdrawal of the younger labour and asked sawmillers to make the absolute best that could be done under the circumstance, which has been done. But the trade is convinced that there is a need to reduce the age of reservation, especially where men are engaged on the production of cases for export and essential war work.

* * *

Research Fellowship Scheme

The following resolution was recently passed by the Industrial Research Committee of the Federation of British Industries:

> This Committee notes with the greatest satisfaction the generous and inspiring example created by I.C.I., Ltd., in providing eighty post-graduate research fellowships tenable at the principal universities, and expresses the hope that this example will be followed by all the major industries as one of the most effective means of providing research facilities and staff, on which the future well-being of British industry so largely depends.

* * *

Tecalemit Ltd.

Mr. E. G. Taylor, formerly General Sales Manager, has now been appointed Sales Director after long service with Tecalemit extending over twenty years; and Mr. C. S. LeClair, M.I.Mech.E., has now been made Technical Director after having been with the Company for nearly ten years in the capacity of Chief Engineer.

Glycerine Supplies

As applications for the supply of glycerine can now be considered, the trade will be interested to know that Fredk. Boehm, Ltd., are still the sole distributors for Messrs. Thomas Hedley and Co., Ltd., of Manchester, Newcastle and London.

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Confectioners' Benevolent Fund

The twenty-seventh annual report and balance-sheet of the Confectioners' Benevolent Fund shows that the total donations for the year ending March 31, 1944, amounted to £84,817 1s. 11d. Although this sum is less than that of the previous "record" year, it is well above those of any of the previous twenty-five years, a matter for congratulation seeing the many calls that are being made for support to funds connected with the war effort.

Income exceeded expenditure by £7,046 6s. 11d., which amount carried forward to capital account makes a grand total of funds in hand of £547,000. That so large an amount should be collected to meet an expenditure made up of pensions and grants—£2,216 14s. 2d., and administration £869 17s. 5d.—is explained by the statement of the committee in the report that the assistance given to the Fund by the many members of the trade in difficult times like these is due to the realisation that they are not working so much for the moment, but for the future.

Demands on funds created by traders for the purpose of relieving distress amongst its members are likely to be heavy in immediate post-war years. The Confectioners' Benevolent Fund is well equipped—as it should be—to be able to expand its activities to meet such demands.

The Executive Committee records its appreciation and expresses its thanks to the President, Lieut.-Colonel A. B. Walters, for his valued service to the Fund during his year of office, and welcomes his successor, Mr. Lawrence E. P. Roberts, to this office for the ensuing year.

Sunflower Seed Factory

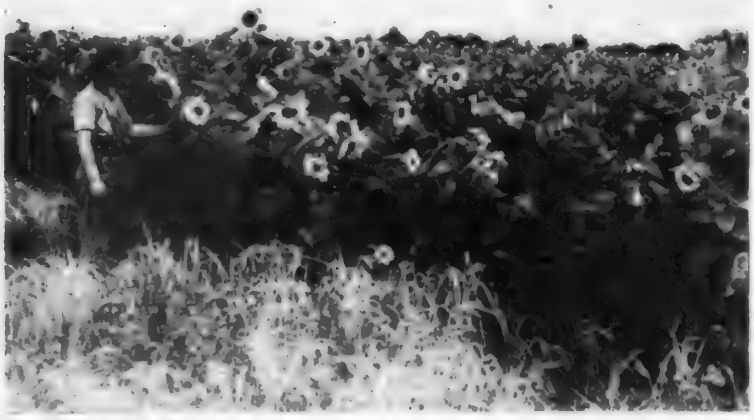
A rural industry of a kind new to this country is about to be started at Bulstrode Farm, near the village of Chipperfield. Its raw material will be sunflower seed, which will be turned into a variety of useful products in a modern and well-equipped factory on the farm. The enterprise involves the co-operation of neighbouring farmers, who are being offered the opportunity to grow sunflowers under contract with Sunflower Seed, Ltd., the company owning Bulstrode Farm and the factory.

Sunflowers have been a profitable crop in Russia for centuries past, but this Hertfordshire undertaking seems to be the first attempt at commercial production and treatment of the seed in this country on any appreciable scale. The sweet, yellow oil secured by pressing the seed is considered equal to olive oil or almond oil for table use. It is also suitable for margarine manufacture and fish-frying.

Among the subsidiary products are food for cattle and poultry and cellulose and potash. It is said, in fact, that no part of this highly decorative crop need be wasted. In Russia the husks themselves are largely used for domestic heating, as well as for fuelling the seed-drying furnaces. They will serve this last purpose here once a sufficient acreage is under cultivation.

Before he came to England forty-five years ago, Mr. G. Music, the chairman of Sunflower Seed, Ltd., was familiar with the then primitive Russian methods of squeezing oil out of sunflower seed. He pays tribute to the support he is receiving from the county war agricultural committee. His plans have been laid on an ample scale. Electricity has been brought to the farm to supply motive power; the new buildings designed for the job include a cottage for the resident chief engineer; and nearly two miles of concrete roads have been laid down on the farm to cope with the expected traffic. A range of bins providing separate storage for each farmer's output has been built by Italian prisoners of war. The drying machinery, installed by Ransomes, Sims and Jefferies, Ltd., of Ipswich, is an adaptation for this new purpose of the Ransome-Davies farm drier for grain crops.

It will not be possible to set up the oil-pressing machinery before next year, and the first crop of seed to be treated will all be converted into poultry food. When a farmer has harvested his sunflower crop he will deliver it by lorry at the factory and will see it pass through the various processes. The crop is first lifted by elevators into a shelling machine, which separates seed from husks and passes it into the drying ovens. Another appliance later cleans the seed and delivers it to be weighed in the farmer's presence, thus determining the price he will receive.



Sunflowers at Bulstrode Farm.
Courtesy of "The Times."

L.C.C. Smithfield Institute

A full-time day course of two years' duration has been started at the Smithfield Institute for youths of sixteen and over.

Applicants for admission should have reached the educational standard required to qualify for the General Schools Certificate or its equivalent. Students will be prepared for the National Diploma of the Federation of Meat Traders. The course should appeal specially to master butchers' sons and those who will eventually have control of a business. Educational visits to food factories, cold stores, abattoirs and farms are a feature of this course. Similar facilities are available for the fish trade, with specialised practical work.

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Professor of Agriculture Appointed

Stephen John Watson, M.Sc., D.Sc., F.R.I.C., director-in-charge of the Jeallot's Hill Agricultural Research Station of Imperial Chemical Industries, has been appointed to the joint post of Professor of Agriculture in the University of Edinburgh and Principal of the Edinburgh and East of Scotland College of Agriculture. The post became vacant by the retirement of Professor Ernest Shearer.

The joint appointment is a key post in agricultural development in Scotland and in the wider colonial field supplied by Edinburgh students, in view of the fact that the future of Scottish agricultural development demands the training of more agriculturists in scientific methods and the intensification of research and development of all matters relating to farm work and produce. Dr. Watson, born in Peru of British parents, is forty-six years of age. He has had experience of teaching agricultural chemistry as a demonstrator and lecturer in Armstrong College, in the Cheshire School of Agriculture, Nantwich, and in the East Anglian Institute of Agriculture, and was also employed in county advisory work. In his association with Imperial Chemical Industries his interests have covered a wide field.

His experimental work is well known to agriculturists and to scientific workers.

Blasting Herrings

Another process is being carried out at the New Standard Ice Company in Aberdeen, known as the "blast" method. Here the herrings are packed ungutted into trays and passed into a tunnel, where currents of cold air blast the fish until they are frozen. After each process the blocks are packed into special cartons and immediately placed into cold store. Up to August, 19,900 cwt. of herrings have been "blasted".

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Hebridean Lobster Industry

A boom is being experienced, after a long period of depression, in the West of Scotland lobster industry. During the past few weeks lobster fishers in the Outer Hebrides have been getting record catches, and large consignments are now reaching the Glasgow markets. Twelve tons of lobsters have been caught by the fishermen of Barra in a week. One family, consisting of a father and two sons, have cleared over £700 in seven weeks at the fishing. Most of the able-bodied lobster fishermen are now serving in the Royal Navy and Merchant Navy, and it is the veterans, many of whom are over seventy, who are reaping the rich sea harvest.

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Obituary

Lieut. H. E. Poynor

The many friends of Mr. Poynor will learn with regret of his death after only a few weeks of service in Normandy. He joined up in the very early days of the war, and it was during an unselfish act of bravery in removing the wounded that he was fatally wounded himself. Mr. Poynor, who was thirty years of age, had been with Messrs. Polak and Schwarz (Eng.), Ltd., for twelve years, and, as those who knew him will remember, he had a wide and practical technical knowledge. The war has already lost to the trade many good friends and able technicians, and it is with no small measure of sorrow that we have to add to the list the name of such an enthusiastic and promising young man as Mr. Poynor.

Wedding

The marriage of Mr. Sam Crompton Holt with Miss Edith Smith, only daughter of Mr. and Mrs. J. Smith, both of Norden, Rochdale, was solemnised at St. Clement's Church, Spotland, Rochdale, on August 30.

Both families are very well known in Rochdale, and Mr. S. C. Holt is a director of Messrs. Wm. Brierley, Collier and Hartley, Ltd., Rochdale, and a grandson of one of the founders of the firm.

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Tobacco Tins

Unless pipe smokers hand in their empty tobacco tins to their tobacconists when they buy full ones, there is likely to be a shortage of tinned tobacco.

The Ministry of Supply points out that many of the factories which previously manufactured tobacco tins are now wholly engaged in turning out millions of watertight food packs urgently needed for the Services. Very few tobacco tins are now being made.

This, together with the fact that hundreds of thousands of tins are lost annually to the tobacco trade because smokers mistakenly think they are doing their duty by putting them among general tin salvage, is causing a shortage which may soon be serious.

Ninety per cent. of all used tobacco tins can be repacked with tobacco after being repaired and sterilised, and smokers and tobacconists are asked to co-operate in keeping them freely circulating.

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Manucol

Supplies of Manucol are again available. Albright and Wilson have been able to increase their production to meet the growing demand for this material, which during the war has been used in a number of essential industries.

Manucol is a pure form of sodium alignate and is supplied as a fine, light powder which dissolves in water to give viscous solutions. It is available in two viscosity grades—viz., Manucol IV and Manucol I—which give high and low viscosities respectively. With these two grades it is possible to obtain solutions of low concentration which cover a very wide range of viscosity. The addition of a calcium salt to a solution of Manucol produces a gel of calcium alginate.

Manucol has a number of applications in the food industry. It can be used for thickening solutions—*e.g.*, in soups and jams—and for stabilising emulsions such as synthetic creams and ice cream.

Certain types of seaweed which grow in profusion on the coasts of Scotland and the Western Isles form the raw material for alginate production. Manucol has the advantage, therefore, of being one of the products manufactured within this country from home-produced materials.

Literature describing the properties of alginates is available.

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New Coffee Trade Organisation

Following the dissolution of the Coffee Trade Association of London, the Coffee Trade Federation has been formed.

The members are: the Coffee Importers' and Exporters' Association of London, Ltd.; the Home Trade Coffee Buyers' Association of London, Ltd.; and the Coffee Brokers' Association of London.

The object is to promote combined action and to deal with matters which concern the coffee trade as a whole at home and abroad.

The affairs of the Federation will be managed by a council consisting of three delegates from each member association.

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Important Plant Negotiation

The whole of the plant and machinery of Suncole Works, Cinderhill, Nottingham, has been acquired by George Cohen, Sons and Co., Ltd. The plant was put down new in 1938 and only worked a few months. Designed for the production of solid fuel, smokeless briquettes and by-products from coal, it comprises rotary retorts, distillation plant, gas producers, very large conveyors, aerial ropeway, two 500-kw. turbo sets, two 25,000-lb. Babcock boilers, sidings and a considerable quantity of plant of a general nature. Everything is for disposal, and a catalogue is available on application.

Overseas Items

South African Meat Control Plan

The whole system of governmental control of supply and distribution of essential commodities, especially foodstuffs, is now on trial in South Africa, as the country's main food control plan—the Meat Control scheme—meets with strong opposition and as the public experiences one of the severest shortages of beef and mutton in its history. In an effort to relieve the meat shortage and to bolster up its meat scheme, which, it is believed, has the general support of the consumer public, the Government has announced it will place half a million pounds of canned beef weekly on the market. This canned beef had formerly been earmarked for military use. In addition the Government of Southern Rhodesia, at the Union's request, is at present making available Rhodesia's reserve stocks of fresh beef.

Cabinet Ministers have been extremely busy defending the scheme in public speeches since it was announced as the Department of Agriculture's scheme in Parliament in May this year by the newly appointed Agricultural Minister, J. G. N. Strauss.—*Reuter's Trade Service.*

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Mexican Farm Products

Mexico exported the greatest amount of agricultural products in her history in 1943. Shipments reached the value of 383,525,000 pesos, according to the Ministry of Agriculture.

The 1943 exports in their order of value are: Henequen, coffee, food, cattle, chicle, fresh bananas, guayule, vegetable wax, garbanzo (chick peas), fibres, cotton, tomatoes, cotton waste, fine and cheap woods for construction, honey, dry chile, bran, and sisal and vanilla sacks.

The value of these last year's exports was more than double that of similar shipments in 1939, amounting to 168,506,000 pesos. Almost all 1943 agricultural products exports went to the U.S., says the report.—*Reuter's Trade Service.*

Argentine Meat for France

The Argentine Government has decided to send 100,000 tons of wheat and 5,000 tons of meat to France, says a recent decree.—*Reuter.*

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New U.S. Commodity Exchange

The National Association of Commodity Exchanges and Allied Trades, Incorporated, a non-profit corporation of leading futures exchanges and other interested trade organisations, was formally organised on August 28.

The charter members of the Association, which is primarily concerned with the championing of a free enterprise system in the United States, comprise the New York Coffee and Sugar Exchange, the New York Produce Exchange, the New York Cocoa Exchange, the Board of Trade at Chicago, also the Chicago Mercantile Exchange, the Chamber of Commerce at Minneapolis, and the Board of Trade at Kansas City.

Chicago has been designated the home office.—*Reuter.*

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Polar Vegetables

In the Soviet Polar Settlements around the Yan River, Verkhoyansk, the average temperature is 16° below zero. For six weeks in the winter the sun disappears completely and the mercury drops to 70° below. During the summer the sun shines day and night for 42 days.

Farmers of Yan River last year tried growing vegetables in the open for the first time. A small area of 12½ acres was planted with potatoes, cabbage, turnips and spinach, and the yields were sufficiently encouraging for 30 acres to be put under vegetable crops this year. Only quick-ripening varieties are planted, and all young plants spend considerable time under cover before being planted out in the fields. Cabbage ripens in from 100 to 110 days, but out of that time it spends 45 days under glass. Potatoes are also sprouted under warm conditions and given a good start before planting.

Ecuador Markets

Mr. Howard H. Tewksbury, U.S. Commercial Attaché, who returned for a brief visit to the United States after four and a half years in Ecuador, said recently that he expects that Ecuador will make an all-out effort to meet Far Eastern competition in global rice markets, and she is counting heavily on acquiring machinery from the United States to help her.

He added that rice is now a leading export crop, but to combat rising living costs Government restricts rice exports in order first to supply domestic requirements.

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International Food and Agricultural Organisation

Mr. L. B. Pearson, Canadian Chargé d'Affaires to the U.S., and now chairman of the Interim Food Commission on Food and Agriculture of the United Nations, announced at a Press conference that the Government of the Philippines has accepted the proposed constitution for a permanent international Food and Agriculture Organisation.

The Philippines thus becomes the first nation to join the F.A.O., which will come into existence upon acceptance of its proposed constitution by twenty nations.

So far as acceptance by the U.S. Government is concerned, Mr. Paul Appleby, American member of the Interim Food Commission, explained that adherence to the new organisation will not be in the form of a treaty or an agreement, but only a "recommendation". It is up to Congress to recommend U.S. membership and to appropriate the 625,000 dollars (£156,000), which is specified as the share of the U.S. in the first year's budget of 2,500,000 dollars (£625,000).

It is hoped to hold the first meeting of the new F.A.O. in January, 1945. In this case, adherence by twenty or more nations would have to be received early in December in order for arrangements to be made.—*Reuter.*

Argentine Cattle Sales

A male Duroc Jersey fetched 4,800 pesos (about £250 at pre-war rates) at the cattle sales at Palermo, which is said to be a world record. An Aberdeen Angus bull by Erupto of Derculich fetched 45,000 pesos (nearly £8,000 at pre-war rates).—*Reuter.*

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More Canned Fish from Portugal

One hundred million tins of Portuguese sardines will soon be on their way to England as a result of a trade agreement signed recently.

Twenty million tins of *carapau*, a fish new to the British market, will also be sent.

This fish looks almost exactly like a sardine, but has a flavour more like a Bismarck herring.

Five million tins of anchovies and 2,500,000 tins of mackerel will make up the rest of the deal, which follows the complete cutting off of the German market from Portugal.—*Reuter.*

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Vitamin E Extracted By Novel Process

A recently awarded U.S. patent describes the following process for making concentrated vitamin E products. Soybean oil or other vegetable oils containing vitamin E are subjected to high-vacuum, unobstructed-path distillation. A fraction is separated containing most of the vitamin E and substantial quantities of the impurities contained in the oil. This fraction is then extracted with a solvent selected from a group which includes ethyl alcohol and ethyl ether. Finally the solvent is distilled off, effecting further concentration of the vitamin E.—*U.S.I. Chemical News, April,* 1944.

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Waste Materials

Among the developments during war-time in the United States there has been increased emphasis on the utilisation of materials normally considered as waste.

Along U.S. sea coasts the starfish is the bane of many oyster fishermen. U.S. scientists have recently been drying and grinding the whole starfish into meal, then feeding this meal to chicks. In comparative tests the starfish meal has given as good results as sardine fish meal when fed in such quantities as did not supply an excess of calcium. Vegetable wastes are also finding a place in U.S. feeding operations. Investigations by Department of Agriculture scientists showed that the blade portions of the leaves of broccoli, free of stems, were unexpectedly high in protein, containing from 30 to 36 per cent. in some cases. This is considerably higher than the 20 per cent. found in alfalfa-leaf meal, and approaches the 40 to 50 per cent. for oil meals. The research also revealed that the leaves are high in carotene, or provitamin A, and in riboflavin, both of which are needed in poultry food.

As a result of these war-time experiments, research with these vegetable wastes is already in the pilot plant stage and is being continued and enlarged in the hope that industry will develop methods that will permit the profitable utilisation of the thousands of tons of waste vegetable leaves produced each year.

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Cereals in Brazil

Following the conference at Hot Springs, Virginia, Brazilian papers have made various suggestions in which way their country could best co-operate with the problem of providing foodstuffs to countries starved by Nazi rule. Profound and lengthy examination of the Brazilian supply position will have to precede this relief action, so that no undue shortage on the home market arises, thus creating new difficulties. But after a thorough study of Brazil's economic situation there is much the country can do to help nations in distress.

As for cereals, the *Correio da Manha* mentions a few which can be exported without creating any inconvenience to the home market, if the right measures are taken in time. Rice, maize, rye, oats, barley and others are very abundant in the country.

In 1940 Brazil produced a total of 7,148,615 tons of cereals (Europe imported during 1934-38 on the average about double this quan-

OBITER DICTA

- How soon after the end of the war it may be possible to abandon the points system no one is in a position to say.—*Mr. Mabane, Parliamentary Secretary to the Ministry of Food.*
- Shetland's herring fishermen need help to secure suitable boats, gear, and equipment.—*Larwick Harbour Trustees.*
- A Government department in London is bound to be hazy about the geographical position of Fraserburgh: somewhere near the North Pole probably.—*Aberdeen Press and Journal.*
- It is hoped that more "fruits of the earth" will become available as shipping is released. A measure of control has come to stay and is in the interests of grower, distributor and consumer alike. A little thought shows this to be necessary if the bad old days of cut-throat competition are to be eliminated.—*Manager of Paine, Rogers and Co., Wholesale Fruiterers.*
- Study of the body weights of 30,000 to 40,000 people during the past year showed that on the whole there had been no sign of any loss in weight of adolescents. Weights of males after the age of 35 and up to 55 were lower than in pre-war days, suggesting that war-time conditions had done much to banish the "middle-age spread."—*Mr. Mabane.*
- Australian exports of meat and butter to Britain have fallen by more than half since the first year of the war. An agreement for the supply of food to Britain during the next four years had just been completed with New Zealand, and the terms of a similar agreement with Australia were now being negotiated with the Commonwealth Government.—*Mr. Bankes Amery.*
- The Battle of the Land is by no means ended.—*Mr. R. S. Hudson, Minister of Agriculture.*
- In a world shortage of food, herrings may yet become a staple article of diet in countries where they were never eaten before the war.—*Birmingham Post.*
- There is no city in the world would allow what goes on here on a Saturday or Sunday. Go out into the working-class districts and look at the dirty bins running over with filthy matter with millions of flies swarming around.—*Councillor Jim Larkin, Dublin Corporation.*

tity). Brazilian products consisted of the following items: rice, 1,542,744; oats, 7,800; rye, 12,979; barley, 11,342; maize, 5,427,500; wheat, 132,150 tons. This production could be increased fourfold, says the *Correio da Manha*, by increased irrigation and developing areas which so far have not been cultivated.

Brazilian authorities will not spare any effort to solve the problem of supplying Europe's needy nations.—*Reuter's Trade Service*.

Companies

McDougalls Trust Limited

At the eleventh annual general meeting of McDougalls Trust, Ltd., Mr. Kenneth A. E. Moore, the chairman, presided.

The following is an abstract from the statement by the chairman, circulated with the report and accounts:

"You will see from the annexed accounts that the operating company —McDougalls, Ltd.—has again had a successful year and that, after providing for excess profits tax and contingencies and adding £20,000 to the advertising reserve, the same dividends have been paid to the holding company —McDougalls Trust, Ltd.—so enabling it to maintain, for the eighth year in succession, a distribution of 10 per cent. on the ordinary shares.

"This laconic summary of the financial results shows how the business has done, but not what it has done. It seems, therefore, not inappropriate, particularly at this stage of the war, to interpret the accounts in terms of service to the community and from the human angle.

"From the fact that the business has earned profits substantially in excess of its pre-war standard you will be correct in inferring that it has produced, packed, sold and distributed more McDougalls Self-Raising Flour than ever, but since dividends are limited to the pre-war level by the incidence of taxation and Government control, these increased services to the community have brought no financial reward to the proprietors. In other words, the profit on the extra work done by the mills, plant and organisation provided by the shareholders has been, or will be, handed over to the community in the shape of E.P.T. or by way of adjustment of remuneration under Government control agreements.

"The accounts of McDougalls, Ltd., are still subject to adjustment by reference to the terms of the remuneration agreements concluded or to be concluded with H.M. Government in relation to the control of flour-milling activities as from September 3, 1939.

"In the meantime our policy, after making modest additions to trading reserves, is to maintain dividends at the pre-war level of £202,000 per annum and to transfer the remaining profits to excess profits tax and contingencies account. The balance on this account, after meeting the computed liability to excess profits tax down to March 31, 1943, amounts to £280,000, and this figure should amply cover any adjustment referred to in the preceding paragraph. The financial position remains strong and liquid, and the general and advertising reserves, aggregating £250,000, are invested outside the business in British Government securities."

The report and accounts were adopted.

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W. J. Bush and Company Ltd.

In the course of the statement by Dr. P. C. C. Isherwood, O.B.E., Ph.D., F.R.I.C., chairman and managing director of Messrs. W. J. Bush and Co., Ltd., presented at the forty-seventh annual meeting of the Company, he said:

"Much has been written lately on the importance of research, and a layman might be pardoned for thinking that research with a big 'R' is a new invention. As a matter of fact, your Company, in common with all other progressive chemical concerns, has for very many years devoted much time to this vital side of the business, and much of our success has been due to this activity. I can assure you that we have always got this important matter very much in mind.

"I am strongly of the opinion that, if our country is to raise or even maintain its pre-war standard of living, export trade is of paramount importance, and in this connection private enterprise must be given full scope and encouragement with a minimum of Government interference. While control is a necessary evil in war and is being in the main sympathetically and efficiently administered, in my view as a long-term policy all the Government needs to do is 'to hold the ring' so as to ensure fair trading conditions. Given these, individual effort will provide continued and increasing prosperity, and the earlier that war-time control is relaxed and ultimately withdrawn, so much the sooner will general trading prosperity be achieved.

"Trade associations, in the work of which your company has always taken an active part, are of inestimable benefit in preserving contact between manufacturers for discussion of matters of common interest for the good of all."

At the meeting the proposed final dividend of 6 per cent., making 10 per cent. for the year, was approved; the retiring directors, Mr. C. F. Bush, Mr. A. J. McIntyre and Mr. M. St. Alphonse, were re-elected, and the auditors, Messrs. Turquand, Youngs, McAuliffe and Co., were reappointed.

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Cow and Gate

In his statement at the meeting of Cow and Gate, Mr. W. R. B. St. J. Gates, the chairman, foreshadowed another satisfactory report next year. For the past year the dividend has been increased from 10 per cent. to 15 per cent. despite the necessity of financing the growing needs of the business out of earnings, pending the time when relaxation of control of capital issues enables fresh capital to be raised. The operations of the company now cover the whole field of the dairy industry and the future is viewed with some optimism by the chairman.

The results of the business to date are the consequence of careful planning over a long period. It continues to be the policy to take a balanced and long-sighted view with the object of expanding trade still further. Progress has been made in all sections.

News from the Ministries

Professor J. A. Scott Watson

The Minister of Agriculture and Fisheries has appointed Professor J. A. Scott Watson, M.C., M.A., to the newly created post of Chief Education and Advisory Officer to the Ministry.

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Milk Figures

Replying to a Parliamentary question, Mr. R. S. Hudson, Minister of Agriculture, recently gave interesting figures in the House of Commons on milk consumption in England and Wales. For the year ended May 31, 1944, the liquid milk consumed was 1,047 million gallons, compared with 766 million gallons for 1939, an increase of nearly 37 per cent. The quantity of liquid milk sold through the Milk Marketing Board for the same periods was 1,194 million gallons and 1,086 million gallons respectively, an increase of 10 per cent.

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Thanks to Food Factories

A message of thanks to workers in all food factories from Colonel Llewellin, the Minister of Food, and three men of the fighting Services has been recorded. Copies of the record can be obtained by food factories on loan, free of charge, from the Public Relations Division, Portman Court, London, W.1. The record is suitable for playing on any ordinary turn-table, pick-up and speaker apparatus, and the playing time is two minutes.

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Flour Confectionery

The Ministry of Food announced that, as from August 20, manufacturers executing orders for flour confectionery placed under the Ministry's priority scheme would receive an increased allowance of preserves for the purpose. The allowance is based on the quantity of sugar and fats authorised for the execution of an order, and will be increased from 2 lbs. to 4 lbs. of preserves for every 30 lbs. of sugar and fats authorised.

Whisky—for Export

Colonel J. J. Llewellin, Minister of Food, speaking at Aberdeen recently, said that the resumption of whisky-making would not mean any more in the near future for consumers in Britain. The increased supplies would go to help the rebuilding of our oversea trade.

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Revocation of the Spices (Control) Order, 1943

The Minister of Food has revoked the Spices (Control) Order, 1943, which required quarterly returns to be made of stocks amounting to more than 10 cwt. of unprocessed cinnamon and stocks of unprocessed nutmeg and mace amounting in either case to 20 cwt. Persons holding such stocks were also prohibited from processing or disposing of them except under licence.

The improved supply of these spices in relation to current demand has made it unnecessary to keep these instructions in force.

The revocation of the Spices (Control) Order takes effect on August 31, 1944.

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Soya Content of Pork Sausages

The Ministry of Food announces that, in view of the recent increase in the meat content of pork sausages, an Order has been made (S.R. & O. 1944 No. 888) amending Article 4 of the Meat Products, Canned Soup and Canned Meat (Control and Maximum Prices) Order (S.R. & O. 1944 No. 763). The amendment provides for the inclusion of 5 per cent. low fat soya (instead of 7½ per cent. as at present) in pork sausage and pork sausage meat (including pork slicing sausage), with a tolerance or margin as at present of ½ per cent. above and below. The new Order, which came into effect on August 6, does not affect the requirement that 7½ per cent. low fat soya must be put into beef sausage and beef sausage meat (including beef slicing sausage).

Wheat Commission

The Minister of Agriculture and Fisheries and the Secretaries of State for Scotland and the Home Department have appointed Mr. Victor Joseph, of J. Lyons and Company, to be a member of the Wheat Commission, representing the interests of bakers of bread.

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Notice to Pre-war Herb Importers

The Ministry of Food announces that it is prepared to consider applications from importers to participate in the distribution of a limited quantity of imported herbs.

Participation will be granted only to those applicants who imported thyme, sage and marjoram for culinary purposes during the three years ended August 31, 1939. Importers are invited to apply to the Import Section, Ministry of Food, 59, Holywell Street, Oxford, for forms on which they must make application to participate in the distribution and on which they will be required to certify for qualification their trading in the datum period.

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Dealings in Cereals and Cereal Products Abroad

The Ministry of Food draws attention to the regulations governing transactions in cereals and cereal products abroad. All dealings in these commodities outside the United Kingdom are at present governed by the Cereals and Cereal Products (Requisition and Control) Order dated September 3, S.R. & O. 1939, No. 1035, but as from October 15, 1944, this Order will be revoked and all licences issued thereunder will cease to have effect as from that date. Thereafter it will be an offence against the Defence Regulations to deal in cereals or cereal products outside the United Kingdom except under the terms and conditions of a licence issued under the new Cereals and Cereal Products (Licensing and Control) (Dealings Abroad) Order S.R. & O. 1944, No. 1035, which comes into force on October 15.

Mr. J. T. S. Lewis

The Minister of Food has appointed Mr. J. T. S. Lewis to be his Assistant Private Secretary in succession to Miss M. D. Robins, who has been appointed by the Parliamentary Secretary as his Private Secretary, in place of Mr. E. Jones-Parry.

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Plant Pathology Laboratory, Harpenden

Mr. C. T. Gimingham, O.B.E., B.Sc., F.R.I.C., has been promoted to the post of Director of the Plant Pathology Laboratory of the Ministry of Agriculture and Fisheries at Harpenden to succeed Mr. J. C. F. Fryer, O.B.E., M.A., who has been appointed Secretary to the Agricultural Research Council.

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Fire Wastage Campaign

"Fires, harmful to the war effort, will have just as wasteful an effect upon our peace-time effort," said Sir Stafford Cripps, P.C., M.P., Minister of Aircraft Production, presiding at the Industrial Fire Brigades Regional Finals at Bradford.

The competitions are sponsored by the Admiralty, the Ministry of Supply and the Ministry of Aircraft Production with the close co-operation of other Government departments concerned. Their purpose is to promote the efficiency of works brigades and thereby to maintain a high standard of fire prevention in industry throughout the country.

"This fire danger is something which perhaps the ordinary person is liable to underestimate in its effect upon our war effort and our war efficiency," Sir Stafford Cripps said. "During the last year, I am glad to say, very largely, I think, due to the greater fire consciousness of people and due to the increase in the efficiency of the fire-fighting services of the country, we have lost much less in the way of production and in the way of working time from the incidence of fire. Most of these fires recently have been caused, not by the enemy, as they were during the blitz period, but by the carelessness of civilians or by defective machinery or plant; and one such bit of carelessness or defective wiring is capable of doing as much damage to our war production as a bomb or series of bombs dropped by the enemy upon a war production factory."

Expressing the hope that the competitions and all that lay behind them would become a permanent part of our fire-fighting organisations, Sir Stafford Cripps pointed out that, if the incidence of fire could be diminished in peace-time, the level of production would rise, and with it the standard of living of all the people in the country.

* * *

Permits for Dairy Plant and Machinery

Under a recent amendment of the Machinery, Plant and Appliances (Control) (No. 3) Order, 1942, licences are now required to acquire all kinds of machinery, plant and equipment used for the handling, treatment and distribution of milk, including the conversion of milk into milk products. But under the provisions of a general licence issued by the Board of Trade persons may be authorised to acquire control of such goods on receiving the written permission of the Minister of Food.

Forms of application for permission to acquire dairy plant and machinery for use in Great Britain and Northern Ireland may be obtained from the Ministry of Food, Milk Division, Giggs Hill Green, Thames Ditton, Surrey.

* * *

Death of Mr Launcelot Hill

Mr. Launcelot Hill, a senior official of the Ministry of Food, who has been in the Ministry since the outbreak of war, has died suddenly. Mr. Hill was adviser at Colwyn Bay to the General Department of the Ministry. Formerly a senior partner of the firm of Hill, Vellacott and Co., chartered accountants, he was a financial expert, and brought to the Ministry the benefit of his wide experience in these and other directions.

Among positions he had held were those of President of the Institute of Chartered Accountants, accountant to the joint committee set up by the British and Argentine Governments to inquire into the condition of the Anglo-Argentine meat trade in 1935, member of the London Passenger Transport Arbitration Tribunal, the Voluntary Hospitals Commission (1935), the Sugar Commission (1936), and the committee of inquiry into coal distribution costs (1938).

At a meeting of the Food Supply Board, of which Mr. Hill was a member, Sir John Bodinnar, Commercial Secretary, on Tuesday paid a tribute to his work and the value to the Ministry of the services of a man of his varied experience. Perhaps best known to Ministry officials as Chairman of the Margins Committee of the Food Supply Board, he was also regarded as an expert on whaling, and during the time when the Ministry was arranging whaling expeditions he was responsible for their general organisation.

* * *

Visit of Australian Food Experts

Four Australian officials have now arrived in England for discussions with officials of the Ministry of Food, the object of which will be to ensure that the Australian estimates are as nearly as possible comparable with the published estimates for Canada, the United States and the United Kingdom. The Australian experts are led by Dr. F. W. Clements, M.D., B.S., D.P.H., D.T.M., of the Commonwealth Department of Health, Director of the Australian Institute of Anatomy and Chairman of the Australian Nutrition Committee, and include Professor Henry Priestley, B.Sc., F.R.A.C.P., M.D., Ch.M., Professor of Biochemistry at Sydney University, Mr. I. A. Butler, B.Econ., Head of the Economic and Statistical Section of Commonwealth Food Control, and Mr. J. C. Stephen, of the Commonwealth Statistician's Office.

These discussions should enable the comparison already made between the three countries to be extended to cover Australia as well.

Information and Advice

Synthetic Cream and Ice Cream

9,414. *Required information regarding the manufacture of synthetic cream and ice cream.* (Glos.)

Artificial cream and other emulsions rich in fat are made by using as protective colloids concentrated protein solutions of other phospho-proteins, to which may be added dissolved proteins, preferably globulins and albumen. The oil or fat is added gradually, with stirring, to the protein solution, and the mixing, which is effected by simple stirring, may be at a temperature at which the fat is liquid. With some kinds of emulsifying machines the mixture may be effected at below the melting-point of the fat. A fat having the desired melting-point may be prepared by melting together oils and hard fats which may be obtained by hardening oils.

In making artificial cream, for instance, arachis oils and hard fat are mixed to give a product having the melting-point of milk fat, and this mixture may be sterilised before use by heating at 100° C. The fat is added at above 30° C., preferably at 40° C., to milk evaporated preferably under vacuum at 50° C. to 60° C., and containing 50 to 70 per cent. of solids. Milk or water is added during the addition of the fat to keep the mixture at a suitable consistency. After thorough stirring the mixture is homogenised while hot.

With reference to ice cream, the following books might be consulted.

Handbook for Ice-Cream Makers, by L. J. Hynes.
Ice-Cream Plant and Manufacture, by R. G. Reid.
Making of Ice Cream, by L. R. M. Feltham.

The above books are published by Leonard Hill Limited.

A very modern form of powder and one which is increasing in popularity is known as the "cold-mix" ice-cream powder, in that no heating is required in the preparation of ice cream from it.

In order to make a batch of 100 lb. of ice-cream powder, the following recipe might be useful:

Sugar, finely milled	70 lb.
Skim-milk powder	17½ ,,
Filler, say soya-bean flour	7½ ,,
Colloid, say gum tragacanth	5 ,,

A formula for hot-mix ice-cream powder is as follows:

Arrowroot	10 lb.
Powdered gelatin	1¼ ,,
Skim-milk powder	3¾ ,,
Sugar (powder)	15 ,,

Add 6 oz. powder to quart of milk plus 6 to 8 oz. sugar. Heat the milk in a water-jacketed pan to about 90° C.

Make the requisite quantity of powder into a thin cream with a little cold milk, and pour slowly into almost boiling bulk milk with vigorous agitation. Continue heating the whole in water-bath for another 10 to 25 minutes until it has finished thickening. Cool and freeze.

Information Supplied

9,302. *Names and addresses of firms manufacturing greaseproof lined cardboard containers.* (Sussex.)

9,304. *Names and addresses of any British firms manufacturing tinplate and plastic rings.* (Malta.)

9,305. *Name and address of the manufacturers of "Pulvex" lice powder.* (Essex.)

9,307. *Information as to the value of methyl bromide as a fumigant for the control of grubs, insects and their eggs in foodstuffs and also the usual way of applying it.* (Warwick.)

9,309. *Information regarding the reduction of the salinity of hams.* (Surrey.)

9,317. *Information regarding the method of making spaghetti and also the addresses of firms specialising in the machinery for same.* (Gibraltar.)

9,321. *Information on the making of good quality ice cream powder and the machinery required for the manufacture of large quantities.* (Eire.)

9,323. *Information regarding potato plastics.* (London.)

9,325. *Names and addressess of manufacturers of the latest models of machinery for the main stages of biscuit production and also packing machines.* (Trichinopoly.)

9,327. *Names of makers of powder filling machines.* (Bucks.)

9,337. *Names of firms manufacturing irradiated yeast for poultry.* (Eire.)

9,338. *Information concerning constituents of sauces.* (Kenya.)

9,339. *Literature concerning the preparation, by-products, etc., of cereals on a small scale.* (Devon.)

9,349. *Information concerning the manufacture of calves'-foot jelly.* (N. Ireland.)

9,355. *Name and address of firm supplying instruments and apparatus for testing flour.* (South Africa.)

9,366. *Method of preparing a cold drink (to be bottled either as served or in concentrated form) which can be made from gooseberries.* (Glos.)

9,367. *Details concerning the dehydration of vegetables.* (Nyasaland, Africa.)

9,368. *Names and addresses of any firms likely to supply a 10-20 gallon enamel-lined jacketed pan up to 60 lbs. pressure.* (Herts.)

Information Required

9,397. *Names of any firms who make or supply plant for production of coffee extract.* (London.)

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

An Improved Method of, and Means for, Coating the Inside Surfaces of Containers

This invention relates to a method of, and means for, coating the inside surfaces of containers, and is particularly applicable to metal containers such as are used for fruit and other foodstuffs.

The material used for coating for surfaces aforesaid may be a lacquer, varnish, enamel or paint, and forms no part of the present invention, which has for its chief object to provide an improved method of applying a protective coating to the inside surfaces only of fabricated containers; that is to say, containers which are closed at one end and open at the other, such containers being ready, after coating, to receive their contents. The apparatus for carrying out the improved method is simple in construction and operation and is fully capable of meeting the demands of mass production without materially increasing the cost of the finished containers.

The method is characterised by the steps of supporting each container with its open end upwards, running into it a quantity of liquid material at least sufficient to provide the requisite coating, directing the open end of said container downwards, and thereupon rotating or spinning said container about an axis which passes through both ends thereof until the coating material has been caused to extend over substantially the whole inside surface of said container.

This rotating or spinning produces a centrifugal action on such coating material as remains adherent to the interior of the container after the latter has been inverted, thus causing it to flow substantially evenly over the walls of said container and, in particular, filling the small crevice which usually exists between the wall of the container and the periphery of its base.

An excess of coating material may be deposited in each container and allowed to drain away before the rotation or spinning operation, which latter may be eliminated when the amount of coating material deposited is sufficient substantially to fill the container.

In the case of containers each having a seam extending from end to end thereof, the containers are preferably tilted with the seams at their lower sides.

The invention also includes apparatus for coating the inside surfaces only of containers which are closed at one end and open at the other, comprising means for conveying the containers, with their open ends upwards, beneath a device adapted to deposit in each container a quantity of liquid material at least sufficient to provide the requisite coating, and means whereby said container is subsequently caused to assume, and is supported in, a position with its open end downwards so that any excess material can drain therefrom, the amount of coating material initially deposited or the operation of said supporting means being such that said material extends over substantially the whole inside surface of said container.

499,653. Arthur Holden and Sons, Limited.

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

561,334. THORNLEY, B. D., and JONES, N. W. V.: Production of an enzyme substance and lecithin from animal glands.

561,342. TECALEMIT, LTD., and LE CLAIR, C. C. S.: Filtering of oils.

561,404. ARMSTRONG, C. M. C.: Boiler feed and like regulators.

561,416. LYSAGHT, LTD., J., and PLUMLEY, E. W.: Methods of cooling pickling tanks.

561,418. NEWMAN, J. E., and KENNEDY, D. S.: Apparatus for drying grain.

561,423. SIGNODE, LTD., JORDAN, C. D., and NOBLE, F. W.: Spacing means for use in the packaging of articles.

561,438. PYRENE CO., LTD., and NOTTINGHAM, R. A.: Fire-extinguishing installations.

561,440. PATON, CALVERT AND CO., LTD., and PATON, W.: Canisters, boxes and like containers.

561,483. PEEK, FREAN AND CO., LTD., and RONDOLIN, L.: Biscuit-cutting machines.

561,521. BAKER, T. H.: Apparatus for extracting air or gaseous matter from liquids.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

DIASANA.—627,405. Tea, coffee, cocoa, chocolate; confectionery and sweetmeats (none being medicated); biscuits (other than biscuits for animals), and cakes. **Barker and Dobson, Ltd.**, Franklin Place, Whitefield Road, Everton, Liverpool, 6.

LINGFOSTUFFING.—627,807. Stuffing, consisting principally of cereal products, for meat, poultry, and the like. **Joseph Lingford and Son, Ltd.**, 5, Durham Street, Bishop Auckland, Durham.

NIG-NOGS.—627,929. Biscuits (other than biscuits for animals). cakes, pastry, and confectionery (not medicated). **Thomas Jarvie Winning,** "Shilford," Westfield, Gosforth, Newcastle-on-Tyne.

SLIPPIES.—628,403. Sweetmeats and confectionery (none being medicated). **Tavener Rutledge, Ltd.,** 68, Beech Street, Edge Lane, Liverpool.

New Companies

Tom Chandley, Limited. (387243.) 14, Egerton Road, Fallowfield, Manchester. To carry on bus. of bakery engineers, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: W. Shaw, 14, Denby Lane, Heaton Chapel, Lancs; T. C. Chandley, 14, Egerton Road, Fallowfield, Manchester.

Sunflower Products (Herts), Limited. (387388.) Bulstrode Farm, Chipperfield, Herts. To carry on bus. of growers and manufacturers of and dealers in food products, etc. Nom. cap.: £500 in £1 shares. Dirs.: G. Music, Bulstrode Farm, Chipperfield, Herts; W. H. Watts, Hazelbank, Leyton Green, Harpenden; E. F. Hurt, 12, Dalkeith Road, Harpenden.

W. E. Smith (Manufactured Products), Limited. (387393.) 2, King's Walk, Nottingham. To take over a bus. of pickle and preserve manufacturers carried on by the administrators of the late Walter E. Smith at Thorneywood Rise, Nottingham.

Prime Fisheries, Limited. (387460.) Digby Chambers, Post Office Road, Bournemouth. Nom. cap.: £5,000 in £1 shares. Dirs.: Alice E. McInnes, Norfolk Hotel, Bournemouth; Miss M. C. Cole, 4, Fernbank, St. Stephen's Road, Bournemouth.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.